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EDITED

By LADY SMITH.

“How delightful and how consolatory it is, among the disappointments and anxieties of life, to observe Science, like Virtue, retaining its relish to the last!”

Sketch of a Tour on the Continent, vol. ii. p. 60.

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A REVIEW OF THE MODERN STATE OF BOTANY,

WITH A PARTICULAR REFERENCE TO THE NATURAL SYSTEMS OF
LINNÆUS AND JUSSIEU*.

[“*A Review of the modern State of Botany*,” mentioned Vol. i. p. 494, not having been printed in the *Transactions of the Linnæan Society*, it may prove an acceptable addition to the present work to introduce this Essay, which from its situation in the *Encyclopædia Britannica*, not being accessible to general readers, is given entire in this place.]

THE Linnæan system of botany, the principles upon which it is founded, with its application to practice, have all been amply elucidated in the fourth volume of the *Encyclopædia Britannica*. The reader will there find a general view of this celebrated system, including the generic characters, as well as some of the specific differences, of most plants hitherto discovered, with their qualities and uses. The terminology of Linnæus is explained; his arguments for the existence of sexes in flowers are detailed; his ideas of a natural method of classification, and of its utility in leading to a knowledge of the virtues of plants, are subjoined to a compendious history of botanical science.

The writer of the present supplementary article proposes to take a different view of the subject. This study has, within twenty or thirty years past, become so popular, and has been cultivated and considered in so many different ways, that no dry systematic detail of classification or nomenclature is at all adequate to convey an idea of what botany, as a philosophical and practical pursuit, is now become. The different modes in which different nations, or schools, have cultivated this science; the cir-

* From the second volume of the Supplement to the *Encyclopædia Britannica*.

cumstances which have led some botanists to the investigation of certain subjects more than others; and the particular success of each; may prove an amusing and instructive object of contemplation. In this detail, the history of scientific botany will appear under a new aspect, as rather an account of what is doing, than what is accomplished. The more abstruse principles of classification will be canvassed; and the attention of the student may incidentally be recalled to such as have been neglected, or not sufficiently understood. The natural and artificial methods of classification having been, contrary to the wise intention of the great man who first distinguished them from each other, placed in opposition, and set at variance, it becomes necessary to investigate the pretensions of each. The natural method of Linnæus may thus be compared with his artificial one; and as the competitors of the latter have long ceased to be more than objects of mere curiosity, we shall have occasion to show how much the rivals of the former are indebted to both. In the progress of this inquiry, the writer, who has lived and studied among the chief of these botanical polemics, during a great part of their progress, may possibly find an occasional clue for his guidance, which their own works would not supply. No one can more esteem their talents, their zeal, and the personal merits of the greater part, than the author of these pages; but no one is more independent of theoretical opinions, or less dazzled by their splendour, even when they do not, as is too often the case, prove adverse to the discovery of truth. Nor is he less anxious to avoid personal partiality. *Incorruptam fidem professis, nec amore quisquam, et sine odio, dicendus est.*

About the end of the seventeenth century, and the beginning of the eighteenth, the necessity of some botanical system, of arrangement as well as nomenclature, by which the cultivators of this pleasing science might understand each other, became every day more apparent. Nor was

there any deficiency of zeal among the leaders and professors of this science. Systems, and branches of systems, sprung up over the whole of this ample field, each aspiring to eminence and distinction above its neighbours. Many of these, like the tares, that fell by the way side, soon withered for want of root ; others, like the *herba im-
pia* of the old herbalists, strove to overtop and stifle their parents ; and all armed themselves plentifully with thorns of offence, as well as defence, by which they hoped finally to prevail over their numerous competitors. This state of scientific warfare did not, in the mean while, much promote the actual knowledge of plants, though it prepared the way for a final distribution of the numerous acquisitions, which were daily making, by the more humble, though not less useful, tribe, of collectors and discoverers. The success of the Linnæan artificial system is not altogether, perhaps, to be attributed to its simplicity and facility ; nor even to the peculiar attention it commanded, by its connexion with the striking phænomenon, brought into view at the same time, of the sexes of plants. The insufficiency, or at least the nearly equal merits, of the many other similar schemes that had been proposed, began to be most strongly felt, just at the time, when the great progress and success of practical botany, rendered the necessity of a popular system most imperious. While the cause of system was pending, some of the greatest cultivators of the science were obliged to have recourse to alphabetical arrangement. This was the case with Dillenius, the man who alone, at the time when Linnæus visited England, was found by him attentive to, or capable of understanding, the sound principles of generic distinction. These he probably understood too well to presume to judge about universal classification. It was the fashion of the time however for every tyro to begin with the latter ; and the garden of knowledge was consequently too long encumbered with abortive weeds.

Linnæus had no sooner published and explained his

method of arranging plants, according to that which is generally termed the Sexual System, than it excited considerable attention. His elegant and instructive *Flora Laponica* could not be perused by the philosopher or the physician, without leading its readers occasionally aside, from the immediate objects of their inquiry, into the paths of botanical speculation, and awakening in many a curiosity, hitherto dormant, on such subjects. But the scope of that limited Flora is by no means sufficient to show either the necessity or the advantages of any mode of arrangement. Linnæus may be said to have grasped the botanical sceptre, when, in the year 1753, he published the first edition of his *Species Plantarum*; and the commencement of his reign must be dated from that period. The application of his system to universal practice, in this compendious distribution of all the known vegetables of the globe; his didactic precision; his concise, clear, and certain style of discrimination; his vast erudition displayed in synonyms; and, perhaps as much as any thing else, the fortunate invention of trivial or specific names, by which his nomenclature became as evidently commodious, and indeed necessarily popular, as any part of his performance; all these causes co-operated to establish his authority. An immediate impulse was given to practical botany. The vegetable productions of various countries and districts were marshalled in due array, so as to be accessible and useful. A common language was established throughout the world of science; a common stock of knowledge and experience began to accumulate, which has ever since been increasing, and can now never be lost. Of these partial Floras to which we allude, those of Lapland and Sweden, the productions of Linnæus himself, were the models of most of the rest, and have never, on the whole, been excelled.

Hence arose the Linnæan school of botany, which though founded in Sweden, extended itself through Holland, Germany, and more or less perfectly in other parts

of Europe, though not without impediments of which we are hereafter to speak. In Britain it was firmly established by the influence of some of the most able pupils of Linnæus, and strengthened at length by the acquisition of his literary remains. But these are adventitious supports. The strength of philosophical, like political, authority is in public opinion, and the cement of its power is public good.

As we proceed to trace the practical influence of the Linnæan system, or rather of the facility which it afforded, in botanical studies, it will be useful at the same time to observe the effects of adventitious circumstances, which render botany almost a different sort of study in different parts of the habitable globe.

In those northern ungenial climates, where the intellect of man indeed has flourished in its highest perfection, but where the productions of nature are comparatively sparingly bestowed, her laws have been most investigated and best understood. The appetite of her pupils was whetted by their danger of starvation, and the scantiness of her supplies trained them in habits of œconomy, and of the most acute observation. The more obvious natural productions of such climates are soon understood and exhausted. But this very cause led Linnæus to so minute a scrutiny of Swedish insects, as had never been undertaken before in any country ; in consequence of which a new world, as it were, opened to his contemplation, and the great Reaumur declared that Sweden was richer in this department than all the rest of the globe. Such indeed was its appearance, because it had been more carefully examined. When the ardour and acuteness of the pupils of the Linnæan school first sought matter of employment for their talents, some few had the means of visiting distant, and scarcely explored, countries ; but this could not be the lot of many. The greater part were confined to their native soil ; and it is remarkable that those who were longest so confined, have displayed in the sequel the

greatest abilities, and have rendered the greatest services to science, independent of the accidents which made the labours of others imperfect or abortive. Such men as Ehrhart and Swartz were not to be satisfied with the general productions of the fields or gardens to which they had access. They had no resource but in the recondite mysteries of cryptogamic botany, in the first instance. To these they directed their microscopic eyes, and more discriminating minds, with the happiest success. When they had derived from hence an ample harvest, Ehrhart, limited in circumstances and opportunities, hindered moreover perhaps, in some degree, by a singularity and independence of character, not always favourable to worldly prosperity, opened to himself a new path. The native trees of the north, and especially the hardy shrubs and arborescent plants of the gardens, had not, as he judiciously discovered, received that correct attention, even from his master Linnæus, which was requisite to make them clearly understood. Difficulties attending the study of these plants, the various seasons in which they require to be repeatedly scrutinized, and the obscurity or minuteness of the parts on which their differences depend, were by no means calculated to deter this laborious and accurate inquirer. He submitted the supposed varieties of the shrubbery, the kitchen garden, and even of the parterre, to the same rigorous examination, and, for the most part, with the happiest success. His discoveries have not received the notice they deserve, for his communications were deformed with asperity and pedantry, and he did not always keep in mind the concise and sober principles of definition, which his preceptor had both taught and practised, and to which he owed so large a share of his well-merited fame. Ehrhart died prematurely; but his name ought to be cherished among those whose talents have advanced science, and who loved Nature, for her own sake, with the most perfect disinterestedness.

The fate of Swartz has been far more propitious to

himself and to the literary world. Having thrown more light upon the cryptogamic productions of Sweden and Lapland than they had previously received, and which has only been exceeded by the more recent discoveries of the unrivalled Wahlenberg, he undertook a botanical investigation of the West Indies. Carrying with him, to this promising field of inquiry, so great a store of zeal and practical experience, his harvest was such as might well be anticipated. Whole tribes of vegetables, which the half-learned or half-experienced botanist, or the superficial gatherer of simples or flowers, had totally overlooked, now first became known to mankind. Tropical climates were now found to be as rich as the chill forests and dells of the north, in the various beautiful tribes of mosses; and the blue mountains of Jamaica rivalled its most fertile groves and savannas in the beauty, variety and singularity of their vegetable stores.

Nor must we pass over unnoticed the discoveries of another illustrious disciple of Linnæus, the celebrated Thunberg, who has, now for many years, filled the professorial chair of his master, with credit to himself and advantage to every branch of natural science. The rare opportunity of examining the plants of Japan, and of studying at leisure the numerous and beautiful productions of the Cape of Good Hope, as well as of some parts of India, have thrown in the way of Professor Thunberg a greater number of genera, if not species of plants, than has fallen to the lot of most learned botanists; except only those who have gone round the world, or beheld the novel scenes of New Holland. These treasures he has contemplated and illustrated with great advantage, so far as he has confined himself to practical botany. We lament that he ever stepped aside to attempt any reformation of an artificial system. It is painful to complain of the well-meant, though mistaken endeavours of so amiable and candid a veteran in our favourite science; but what we conceive to be the interests of that science must form

our apology. We cannot but be convinced, and the experience of others is on our side, that discarding those principles of the Linnæan system which are derived from the *situation* of the several organs of impregnation, and making *number* paramount, has the most pernicious and inconvenient effect in most respects, without being advantageous in any. This measure neither renders the system more easy, nor more natural, but for the most part the reverse of both. We have elsewhere observed, (*Introduction to Botany*, ed. 3. 358,) that the amentaceous plants are of all others most uncertain in the number of their stamens, of which Linnæus could not but be aware. “Even the species of the same genus, as well as individuals of each species, differ among themselves. How unwise and unscientific then is it, to take as a primary mark of discrimination, what nature has evidently made of less consequence here than in any other case !” When such plants are, in the first place, set apart and distinguished, by their monoecious or dioecious structure, which is liable to so little objection or difficulty, their uncertainty with respect to the secondary character is of little moment ; their genera being few, and the orders of each class widely constructed as to number of stamens. Linnæus, doubtless, would have been glad to have preserved, if possible, the uniformity and simplicity of his plan ; but if he found it impracticable, who shall correct him ? Such an attempt is too like the entomological scheme of the otherwise ingenious and able Fabricius. The great preceptor having arranged the larger tribes of animals by the organs with which they take their various food, and which are therefore accommodated to their several wants, and indicative of even their mental, as well as constitutional, characters, Fabricius his pupil would necessarily extend this system to insects. But nothing can be more misapplied. Feeding is not the business of perfect insects. Many of them never eat at all, the business of their existence through the whole of their perfect state, being the propagation of

their species. Hence the organs of their mouth lead to no natural distinctions, and the characters deduced therefrom prove, moreover, so difficult, that it is notorious they could not generally be applied to practice by Fabricius himself, he having, in the common course of his studies, been chiefly regulated by the external appearance of the insects he described. This external appearance depending on the form and texture of their wings, and the shape of their own peculiar organs, the *antennæ*, affords in fact the easiest, as well as the most natural, clue to their arrangement and discrimination.

As we presume to criticize the systematic errors of great practical observers, it cannot but occur to our recollection how very few persons have excelled in both these departments. Ray, Linnæus, and perhaps Tournefort, may be allowed this distinction. We can scarcely add a fourth name to this brief catalogue. The most excellent practical botanists of the Linnæan school have been such as hardly bestowed a thought on the framing of systems. Such was the distinguished Solander, who rivalled his preceptor in acuteness of discrimination, and even in precision and elegance of definition. Such is another eminent man, more extensively conversant with plants, more accurate in distinguishing, and more ready in recollecting them, than almost any other person with whom we have associated. Yet we have heard this great botanist declare, that however he might confide in his own judgement with regard to a species, or a genus of plants, he pretended to form no opinion of classes and orders. Men of so much experience know too much to be satisfied with their acquirements, or to draw extensive conclusions from what they think insufficient premises. Others, with a quarter of their knowledge, find no difficulty in building systems, and proceed with great alacrity, till they find themselves encumbered with their own rubbish; happy if their doubts and uncertainties will afford them a tolerable screen or shelter! But we here anticipate remarks, which will come

with more propriety hereafter. We return from the consideration of the labours of particular botanists, to that of the diversities of nature and circumstance.

While it is remarked that in the cold regions of the north, the skill of the deep and learned botanist is chiefly exercised on the minute and intricate cryptogamic tribes, we are not to infer that Nature is not everywhere rich in beauty and variety. Mosses and Lichens afford inexhaustible amusement and admiration to the curious inquirer, nor are more gorgeous productions entirely wanting. Even Lapland boasts her *Pedicularis Sceptrum*, never seen alive out of her limits, and Siberia offers her own beautiful crimson *Cypripedium*, to console for a moment the miserable banished victims of imperial caprice. Kotzebue, though ignorant of botany, did not pass this lovely plant unnoticed, even in the height of his distress. The authoress of the pleasing little novel called "Elizabeth," has represented in a just light the botanic scenery of that otherwise inhospitable country; yet it must be allowed that its rarities are not numerous, except perhaps in those microscopic tribes already mentioned.

Let us in imagination traverse the globe, to a country where the very reverse is the case. From the representations, or accounts, that have been given of New Holland, it seems no very beautiful or picturesque country, such as is likely to form or to inspire a poet. Indeed the dregs of the community which we have poured out upon its shores, must probably subside, and purge themselves, before any thing like a poet, or a disinterested lover of nature, can arise from so foul a source. There seems however to be no transition of seasons, in the climate itself, to excite hope, or to expand the heart and fancy; like a Siberian or Alpine spring, bursting at once from the icy fetters of a sublime though awful winter. Yet in New Holland all is new and wonderful to the botanist. The most common plants there are unlike every thing known before; and those which, at first sight, look like old acquaint-

tances, are found, on a near approach, to be strangers, speaking a different language from what he has been used to, and not to be trusted without a minute inquiry at every step.

The botany of the Cape of Good Hope, so well illustrated by Thunberg, and with whose treasures he scattered a charm around the couch of the dying Linnæus, most resembles that of New Holland. At least these countries agree in the hard, rigid, dwarfish character of their plants. But the Cape has the advantage in general beauty of flowers, as well as in a transition of seasons. After the dry time of the year, when every thing but the *Aloe* and *Mesembryanthemum* tribes is burnt up, and during which innumerable bulbs are scattered by the winds and driving sands over the face of the country, the succeeding showers raise up a new and most beautiful progeny from those bulbs. The families of *Ixia*, *Gladiolus*, *Iris*, *Antholyza*, *Oxalis*, and many others, then appear in all their splendour. Some of them, the least gaudy, scent the evening air with an unrivalled perfume, whilst others dazzle the beholder with the most vivid scarlet or crimson hues, as they welcome the morning sun.

The lovely Floras of the Alps and the Tropics contend, perhaps most powerfully, for the admiration of a botanist of taste, who is a genuine lover of nature, without which feeling, in some degree of perfection, even botany can but feebly charm. Of one of these the writer can speak from experience; of the other only by report; but he has had frequent opportunities of remarking, that the greatest enthusiasts in the science have been Alpine botanists. The expressions of Haller and Scopoli on this subject go to the heart. The air, the climate, the charms of animal existence in its highest perfection, are associated with our delight in the beauty and profusion of nature. In hot climates, the insupportable languor, the difficulty of bodily exertion, the usual ill health, and the effects of unwholesome instead of salutary fatigue, are

described as sufficient to counterbalance even the pleasure which arises from the boundless variety, and infinite beauty, of the creation around. The flowery trees of a tropical forest raise themselves far above the human grasp. They must be felled before we can gather their blossoms. The insidious and mortal reptile twines among their boughs, and the venomous insect stings beneath their shade. We who enjoy the productions of these climates in peace and safety in our gardens, may well acknowledge our obligations to the labour and zeal of those who, by arduous journeys and painful researches, supply us with the riches of every country in succession. We do not, indeed, enjoy them in perfection; but we can study and investigate at leisure their various beauties and distinctions. We can compare them with our books, and profit by the acuteness of former observers. We can perpetuate, by the help of the pencil or the pen, whatever is novel or curious. We can preserve the plants and flowers themselves for subsequent examination, and return to them again and again in our closet, when winter has fixed his seal on all the instruction and pleasure afforded by the vegetable creation abroad. Yet let not the sedentary botanist exult in his riches, or rejoice too heedlessly in the abundance of his resources. A plant gathered in its native soil, and ascertained by methodical examination, is more impressed on the memory, as well as more dear to the imagination, than many that are acquired with ease, and named by tradition or report. The labours of its acquisition and determination enhance its value, and the accompaniments of delightful scenery, or pleasing society, are recollected, when difficulties and toils are forgotten.

The western continent is, with respect to botany, almost a world in itself. There exists, indeed, a general affinity between the plants of North America and those of Europe, and many species of the arctic regions are the same in both; but there are few common to the more

temperate climates of each. A considerable number communicated by Kalm to Linnæus, which the latter considered as identified with certain well-known plants of our quarter of the world, prove, on more accurate examination, to be corresponding, but distinct species. Instances occur in the genera of *Carpinus*, *Corylus*, *Quercus*, as well as in the *Orchis* tribe, and others. These points of resemblance are found mostly among the vegetable productions of the eastern regions of North America. Mexico, and what little we know of the intermediate space, abound with different and peculiar productions. So, in South America ; Peru, Guiana, Brasil, &c. have all their appropriate plants, of which we know as yet enough to excite our curiosity, rather than to satisfy it. Whatever has hitherto been given to the world respecting American botany has had one considerable advantage. Each *Flora* has been founded on the knowledge and experience of some one or more persons, long resident, and in a manner naturalized, in the countries illustrated. Those regions commonly comprehended under the name of North America, have afforded materials for the *Flora Boreali-Americana* of Michaux, and the more complete and correct *Flora Americæ Septentrionalis* of Pursh. Michaux, Wangenheim, and Marshall, have particularly illustrated the trees of those countries. But all these works have been enriched by the communications and assistance of men who had much more extensive and repeated opportunities of observation than their authors, except Mr. Marshall, could have. Such are the venerable John Bartram, the Reverend Dr. Muhlenberg, Messrs. Clayton, Walter, Lyon, &c. The Mexican Flora has received, for a long course of years, the attention of the able and learned Mutis, who long corresponded with Linnæus, and whose countrymen have prepared the sumptuous *Flora Peruviana* ; each of the authors of which has repeatedly traversed, at various seasons, the rich and interesting regions, whose botanical treasures make so

splendid and novel an appearance in those volumes. Of those treasures, we have still more to learn from the unrivalled Humboldt. The French botanist Aublet, after having gained considerable experience in the Mauritius, resided for many years in Cayenne and Guiana, for the purpose of studying the plants of those countries, of which his work, in four quarto volumes, gives so ample a history and representation.

All the writers just named have been practical botanists. They have generally excelled in specific discrimination, nor have they neglected the study of generic distinctions. Any thing further they have scarcely attempted. It is remarkable that they have all followed, not only the Linnæan principles of definition and nomenclature, but the Linnæan artificial system of classification. This same system was chosen by the veteran Jacquin, in his well-known work on West Indian plants, entitled *Stirpium Americanarum Historia*, as well as by Browne, in his *History of Jamaica*; not to mention Swartz, in his *Flora Indiæ Occidentalis*, who only wanders a little out of the way, to adopt some of Thunberg's alterations. We cannot but observe, that in the very department of botany in which he has most signalized himself, and with which he is most philosophically conversant, the *Orchideæ*, he totally rejects the ideas of Thunberg.

If we now turn our eyes to the oriental world, we shall find that the seeds of Linnæan botany, sown by Koenig, have sprung up and produced successive harvests among the pious missionaries at Tranquebar, who still continue to interweave a sprig of science, from time to time, among their amaranthine wreaths, which are not of this world. India too has long possessed a practical botanist of indefatigable exertion and ardour, who has thrown more light upon its vegetable riches, with the important subject of their qualities and uses, than any one since the days of Rheede and Rumphius. It is scarcely necessary to name Dr. Roxburgh, whose recent loss we deeply lament, and

whose acquisitions and learned remarks are given to the world by the munificence of the East India Company, in a style which no prince has ever rivalled. That enthusiastic admirer of nature, Colonel Hardwicke, and the learned botanist Dr. Francis Buchanan, have also contributed greatly to increase our knowledge of Indian botany. The latter has enjoyed the advantage of investigating, for the first time, the remote and singular country of Nepaul; so prolific in beautiful and uncommon plants, that few parts of the world can exceed it, and yet meeting, in several points, not only the Floras of the lower regions and islands of India, but those of Japan, China, and even Siberia. The only systematic work on East Indian plants, is the *Flora Indica* of Burmann, which is classed according to the Linnæan artificial method. We cannot but wish it were more worthy of the system or the subject; yet, as a first attempt, it deserves our thanks. In speaking of Indian botany, shall we withhold our homage from that great and sublime genius Sir William Jones? who honoured this study with his cultivation, and, like every thing else that he touched, refined, elevated, and elucidated it, with a beam of more than mortal radiance. No man was ever more truly sensible of the charms of this innocent and elegant pursuit; and whenever he adverted to it, all the luminous illustrations of learning; and even the magic graces of poetry, flowed from his pen.

But we must extend our view beyond the utmost bounds of India, and of the then discovered world, to trace the steps of those adventurous circumnavigators who sought out, not only new plants, but new countries, for botanical examination. The names of Banks and Solander have, for nearly half a century, been in every body's mouth. Their taste, their knowledge, their liberality, have diffused a charm and a popularity over all their pursuits; and those who never heard of botany before, have learned to consider it with respect and admiration, as the object to which a man of rank, riches, and talents, devotes his life

and his fortune ; who while he adds, every season, something of novelty and beauty to our gardens, has given the Bread-fruit to the West Indies, and is ever on the watch to prompt, or to further, any scheme of public advantage. With the recollection of such men must also be associated the names of the learned Forsters, father and son, of Sparrmann, and of Menzies, who have all accomplished the same perilous course, and enriched their beloved science. The cryptogamic acquisitions of the latter in New Zealand, prove him to have attended to that branch of botany with extraordinary success, and at the same time evince the riches of that remote country. Indeed, it appears that any country proves rich, under the inspection of a sufficiently careful investigator. The labours of these botanists have all been conducted according to the principles and classification of Linnæus. Forster, under Sparrmann's auspices, has judiciously pointed out, and attempted to remedy, defects that their peculiar opportunities enabled them to discover, but with no invidious aim. They laboured, not to overthrow or undermine a system, which they found on the whole to answer the purpose of readily communicating their discoveries, but to correct and strengthen it for the advantage of those who might come after them. It is much to be lamented that, except the *Nova Genera Plantarum*, we have as yet so short and compendious an account of the acquisitions made in their voyage. To the technical history of these, however, the younger Forster has commendably added whatever he could supply of practical utility, and has thus given us all the information within the compass of his means.

Long since the voyages of these celebrated naturalists, the same remote countries have been visited, in our own days, by two learned botanists more especially ; these are M. La Billardière, and Mr. Brown, Librarian of the Linnæan Society. The former has published an account of the Plants of New Holland, in two volumes folio, with fine

engravings; the latter has favoured the botanical world with one volume of a most acute and learned *Prodromus* of his discoveries. As his voyage was made at the public expense, we may trust that the government will consider itself bound to enable him to publish the whole of his acquisitions, in such a manner as to be generally useful. His own accuracy of observation, illustrated by the drawings of the inimitable Bauer, cannot fail to produce such a work as, we will venture to pronounce, has never been equalled. M. La Billardière has disposed his book according to the system of Linnæus, a rare example in France, where any thing not French usually comes but ill recommended. Mr. Brown, on the other hand, has written his *Prodromus*, at least, on the principles of classification established by the celebrated Jussieu, the great champion of a natural system of his own. On this subject we postpone our remarks for the present. Before we can enter on the subject of natural classification, it is necessary to consider the state and progress of botany, for some years past, in the schools, and among the writers, of Europe.

Sweden has continued to maintain her long established rank in the several departments of natural science, nor has Denmark been behind-hand with her neighbour and ancient rival. The son and successor of the great Linnæus endeavoured to follow his father's steps, and was ambitious of not being left very far in the rear; a commendable aim, which his short life, to say nothing of his talents or experience, disabled him from accomplishing. He completed, and gave to the world, the unfinished materials which his father had left, for a Supplement to his *Species Plantarum* and *Mantissæ*; and having enriched the book with many communications of Thunberg and others, as well as a number of original remarks, he felt a strong desire, not altogether unpardonable, of being thought the principal author of the work. All uncertainty on this subject, wherever other helps fail, is removed by the original ma-

manuscript of the *Supplementum Plantarum* in our possession. Ehrhart superintended the printing of this work, and made some alterations in the manuscript, traces of which are perceptible in the affected Greek names, given to some species of *Carex*, *Mespilus*, &c., as well as in their sesquipedalian specific characters. But he had introduced his own new genera of Mosses; which the younger Linnæus thought so alarming an innovation, that he ordered the sheet which contained these matters to be cancelled. We are possessed of a copy, which shows the genera in question to be almost all well founded, and what are now, under Hedwig's sanction, generally received, though by other names. The descriptions of Ehrhart are precise and correct, though his terminology is exceptionable, full of innovations, and crabbed expressions. Two years, almost immediately preceding the death of the younger Linnæus, were spent by the latter in visiting England, France and Holland, and were employed to very great advantage, in augmenting his collection of natural productions, as well as his scientific skill. During this tour, he attached himself strongly, through the medium of his old friend Solander, to Sir Joseph Banks; and while in France, he almost planted, or at least greatly advanced, a Linnæan school in that kingdom. He had scarcely resumed his professorial office at home, when he was unexpectedly taken off, by an acute disease, in his forty-second year. Of the talents and performances of his successor Thunberg, who still with honour fills the chair of the Rudbecks and the Linnæi, we have already spoken. Dr. Swartz is the Bergian professor of Botany at Stockholm. The *Transactions* of the Upsal Academy, founded by the younger Rudbeck, are continued occasionally; and those of the Stockholm one, whose foundations were laid by Linnæus, are published regularly. Both are from time to time enriched with botanical communications, worthy of the pupils of so illustrious a school. A veteran in botanical science, Professor Retzius, still pre-

sides at the University of Lund. The worthy and accurate Afzelius, well known in England, who accomplished a hazardous botanical expedition to Sierra Leone, is the coadjutor of Professor Thunberg; and the difficult subject of Lichens, under the hands of Dr. Acharius, is become so vast and so diversified, as to be almost a science of itself.

Denmark has always possessed some acute and learned botanists, and has, more than most other countries, been supplied with dried specimens of plants, as an article of commerce, from her West or East Indian establishments. Oeder, the original author of the *Flora Danica*, and Muller its continuator, have distinguished themselves; but their fame is inferior to that of the late Professor Vahl, who studied under the celebrated Linnæus, and who is the author of several excellent descriptive works. He undertook no less than a new *Species*, or, as he entitled it, *Enumeratio, Plantarum*, an admirable performance, cut short by his death at the end of the second volume, which finishes the class and order *Triandria Monogynia*. It is almost superfluous to mention, that Afzelius and Retzius, as well as Vahl, in all they have given to the world, have followed the system of their great master. The *Flora Danica*, chiefly a collection of plates, with few synonyms and no descriptions, has come forth, from time to time, for above fifty years past, in fasciculi, without any order, and is still incomplete. It was undertaken by royal command, and, in a great measure, at the sovereign's expense; though regularly sold, except some copies presented to certain distinguished men, as Linnæus.

After the example of Denmark, Sweden, &c. Russia has been desirous of promoting, throughout its vast dependencies, an attention to natural knowledge. Nor was any country ever more fortunate in the possession of an active and intelligent naturalist. The celebrated Pallas successfully devoted a long life to these pursuits, and to the communication of his discoveries and obser-

vations. He prompted the Empress Catherine to offer an unlimited sum for the museum, library, and manuscripts of Linnæus; but, fortunately for their present possessor, the offer was made too late. A *Flora Rossica*, on the most magnificent scale, was undertaken by Pallas, his Imperial mistress proposing to defray the cost of the whole undertaking, not merely for sale, but for gratuitous presentation, on the most princely scale, to all who had any taste or ability to make use of the book. This well-intended munificence was the cause of the ruin of the project. Half of a first volume was bestowed as the Empress intended. But the second part, instead of following the destination of the first, got into the hands of interested people, who defeated the liberal designs of their sovereign, misapplied her money, and by the disgust and disappointment which ensued, prevented the continuance of the work. Those who wished to complete their sets, or to obtain the book at all, were obliged to become clandestine purchasers, buying, as a favour, what they ought to have received as a free gift; and were moreover, like the writer of this, often obliged to put up with imperfect copies. In like manner, the intentions of the great Mr. Howard, respecting his book on Prisons, were rendered ineffectual, by the disgraceful avarice of certain London booksellers, who immediately bought up, and sold at a greatly advanced price, the whole edition, which its benevolent author had destined to be accessible to every body at an unusually cheap rate. These examples, amongst others, show that it is the most difficult thing in the world to employ patronage, as well as gratuitous charity of any kind, to real advantage, except under the guidance of the most rigorous discretion. "All that men of power can do for men of genius," says Gray, if we recollect aright, "is to leave them at liberty, or they become like birds in a cage," whose song is no longer that of nature and enjoyment. The great and the affluent may foster and encourage

science and literature, by their countenance, their attention, and a free, not overwhelming, liberality. But when princes become publishers of books, or directors of academies, they generally do more harm than good. They descend from their station, and lose sight perhaps of their higher and peculiar duties, which consist in promoting the general prosperity, peace, and liberty of their subjects, under the benign influence of which, every art, science, or pursuit, that can be beneficial to mankind, is sure to flourish without much gratuitous assistance.

Several of the immediate scholars of the illustrious Swedish naturalist were planted in different parts of Germany. Murray, to whom he entrusted the publication of that compendious volume, entitled, *Systema Vegetabilium*, and who printed two successive editions of the work, was seated as Professor at Göttingen. Giseke was established at Hamburgh, and, after the death of Linnæus, gave to the world such an edition as he was able to compile, from his own notes and those of Fabricius, of the lectures of their late preceptor, on the Natural Orders of Plants. His ideas on this subject Linnæus himself always considered as too imperfect to be published, except in the form of a sketch or index, at the end of his *Genera Plantarum*. The venerable patriarch, Professor Jacquin, still survives at Vienna, where he, and his worthy son, have enriched botany with a number of splendid and useful works. They have given to the public several labours of the excellent practical botanist Wulfen, and others, which might, but for their encouragement, have been lost. The highly valuable publication of Host on Grasses, is conducted on the plan of Jacquin's works. His *Synopsis* of Austrian plants is an excellent *Flora*, disposed according to the Sexual System, as is the more ample *Tentamen Floræ Germanicæ* of the celebrated Dr. Roth, one of the best practical European botanists, and more deeply versed than most others in cryptogamic lore. The best Linnæan *Flora*, as far as it goes, that the world

has yet seen,—we speak it without any exception,—is the *Flora Germanica* of Professor Schrader of Göttingen, the first volume of which, comprising the first three classes of the sexual system, was published in 1806. The correct distinctions, well-digested synonyms, and complete descriptions of this work, are altogether unrivalled. If the whole should be equally well executed, for which the longest life would be scarcely sufficient, it must ever be the standard book of European botany. Its descriptions of grasses are worthy to accompany the exquisite engravings of the same tribe from the hand of Leers, published at Herborn in 1775, which excel every other botanical representation that we have examined. They will bear, and indeed they require, the application of a magnifying-glass, like the plants themselves. The purchaser of this little volume must however beware of the second edition, whose plates are good for little or nothing. The name of Schrader has long been distinguished in Cryptogamic Botany. In this pursuit, the industrious and accurate botanists of Germany, shut out from extensive opportunities of studying exotic plants, have had full scope for their zeal and abilities. In this field the Leipsic school has distinguished itself. Here the great Schreber first began his career with some of the most perfect cryptogamic works, especially on the minute genus *Phascum*. Here the same author published his excellent *Flora Lipsiensis*, his laborious practical work on Grasses, and finally his improved edition of the *Genera Plantarum* of his friend Linnæus. But, above all, Leipsic is famous for being the residence of Hedwig, whose discoveries, relative to the fructification and generic characters of Mosses, form an æra in botanic science. Under the hands of such an observer, that elegant tribe displays itself with a degree of beauty, variety, and singularity, which vies with the most admired herbs and flowers, and confirms the Linnæan doctrine of impregnation, which the more obvious organs of the latter had originally

taught. Nor must we, in speaking of cryptogamic plants, neglect here to record the names of Weis, Weber, Mohr, Schmidel, Esper, and especially Hoffmann; the plates of the latter, illustrating the Lichen tribe, are models of beauty and correctness. His *Flora Germanica* is a most convenient and compendious manual, after the Linnæan system. *Fungi* have been studied in Germany with peculiar care and minuteness. The leading systematic author in this obscure tribe, Persoon, was indeed born, of Dutch parents, at the Cape of Good Hope; but he studied and published at Göttingen. Two writers, of the name of Albertini and Schweiniz, have published the most minute and accurate exemplification of this natural order, in an octavo volume, at Leipsic, in the year 1805, comprising the *Fungi* of the district of Niski in Upper Lusatia. If their figures are less exquisitely finished than Persoon's, or less elaborately detailed than Schradder's, their descriptions make ample amends.

The German school of botany has, for a long period, been almost completely Linnæan. This however was not always the case, for, in the earlier part of his career, the learned Swede was attacked more repeatedly and severely from this quarter of the world than any other; his ridiculous critic Siegesbeck of Petersburg excepted, who would not admit the doctrine of the sexes of plants, because the pollen of one flower may fly upon another, and his purity could not bear the idea of such adultery in Nature. Numerous methods of arrangement appeared in Germany, from the pens of Heister, Ludwig, Haller, and others, and even Schreber adopted a system like some of these in his *Flora* above mentioned. It would be to no purpose now to criticize these attempts. They cannot rank as natural systems, nor have they the convenience of artificial ones. Part of their principles are derived from Linnæus, others from Rivinus. Their authors were not extensively conversant with plants, nor trained in any sound principles of generic discrimination or combination.

They set off with alacrity, but were soon entangled in their own difficulties, and were left by Linnæus to answer themselves or each other. We here mention these learned systematics, for learned they were thought by themselves and their pupils, merely because they will scarcely require animadversion, when we come to canvass the great question of natural and artificial classification, they having had no distinct ideas of a difference between the two. Hedwig used frequently to lament, that his preceptor Ludwig had never perfected his system of arrangement; but from what he has given to the world, we see no great room to suppose he had any thing very excellent in reserve. Unexecuted projects are magnified in the mists of uncertainty. We have ventured elsewhere, in a biographical account of Hedwig, to remark, that even that ingenious man “did not imbibe under Ludwig, anything of the true philosophical principles of arrangement, the talents for which are granted to very few, and are scarcely ever of German growth. We mean no invidious reflections on any nation or people. Each has its appropriate merits, and all are useful together in science, like different characters on the theatre of human life.”

Germany may well dispense with any laurels obtained by the very secondary merit of speculative schemes of classification, when she can claim the honour of having produced such a practical observer as Gærtner. This indefatigable botanist devoted himself to the investigation of the fruits and seeds of plants. Being eminently skilled in the use of the pencil, he has, like Hedwig, faithfully recorded, what he no less acutely detected. The path he struck out for himself, of delineating and describing in detail, with magnified dissections, every part of the seed and seed-vessel of each genus within his reach, had never been explored before in so regular and methodical a manner. Botanists of the Linnæan school are justly censurable for having paid too little attention to the structure of these important parts, in their generic characters. In-

deed it may be said, that if they were able to establish good genera without them, and, after the example of their leader, merely preferred the more obvious and distinct organs, when sufficient for their purpose, their conduct was justifiable. If generic principles be natural and certain, it matters not on what parts of the fructification they are founded; nor is the inflorescence, or even the herb or root, rejected by sound philosophers, but because they are found to lead only to unnatural and uncertain characters. It is therefore extremely to the honour of Linnæus, Gærtner, and Jussieu, that their conceptions of genera are almost entirely the same. They meet in almost every point, however different the paths by which they pursue their inquiries. Their labours illustrate and confirm each other. Even Tournefort, who conceived so well, on the whole, the distinctions of genera, which he could but ill define, receives new strength from their knowledge, which does not overturn his imperfect performances, but improves them. The accurate student of natural genera cannot fail to perceive, that where Gærtner differs from Linnæus, which is but in a very few material instances, such as his numerous subdivision of the genus *Fumaria*, and his distribution of the compound flowers, it arises from his too intent and exclusive consideration of one part of the fructification, instead of an enlarged and comprehensive view of the whole. In other words, he neglects the Linnæan maxim, that “the genus should give the character, not the character the genus.” Such at least appears to us the case in *Fumaria*. In the syngenesious family, being so very natural in itself, the discrimination of natural genera becomes in consequence so difficult, that Gærtner and Linnæus may well be excused if they do not entirely agree, and they perhaps may both be satisfied with the honour of having collected materials, and disposed them in different points of view, for the use of some future systematic, who may decide between them. However exact Gærtner may have been in discriminating the parts of

seeds, we believe him mistaken in distinguishing the *vitellus* as a separate organ, distinct in functions from the *cotyledons*. His readers will also do well, while they profit by his generally excellent principles, not to admit any of his rules as absolute. They may serve as a clue to the intricacies of Nature, but they must not overrule her laws. Still less is our great carpologist to be implicitly followed in physiological doctrines or reasonings; witness his feeble and incorrect attack on Hedwig's opinions, or rather demonstrations, respecting the impregnation of Mosses. His criticisms of Linnæus are not always marked with that candour which becomes a disinterested lover of truth and nature, nor can we applaud in general his changes of nomenclature, or of terminology; especially when he unphilosophically calls the *germen* of Linnæus, the *ovarium*, a word long ago rejected, as erroneous when applied to plants. These however are slight blemishes, in a reputation which will last as long as scientific botany is cultivated at all. Botanists can now no longer neglect, but at their own peril, the parts which Gærtner has called into notice, and to the scrutiny of which, directed by his faithful guidance, the physiologist and the systematic must often, in future, recur.

We shall close this part of our subject with the mention of the Berlin school, where Gleditsch, who, in 1740, repelled the attacks of Siegesbeck on Linnæus, was Professor, and published a botanical system, founded on the situation, or insertion, of the stamens; the subordinate divisions being taken from the number of the same parts; so that it is, in the latter respect, a sort of inversion of the Linnæan method. In the former, or the outline of its plan, the system of Gleditsch is in some measure an anticipation of that of Jussieu. Berlin has of late been much distinguished for the study of natural history, and possesses a society of its own, devoted to that pursuit. Its greatest ornament was the late Professor Willdenow, who, if he fell under the lash of the more accurate Afze-

lius, is entitled to the gratitude of his fellow-labourers, not for theoretical speculations, but for the useful and arduous undertaking of a *Species Plantarum*, on the Linnæan plan, being indeed an edition of the same work of Linnæus, enriched with recent discoveries. This book, left unfinished at the end of the first order of the *Cryptogamia*, by the death of the editor, wants only a general index to render it sufficiently complete. The *Musci*, *Lichenes*, and *Fungi*, are systematically treated in the separate works of writers devoted to those particular, and now very extensive, subjects, from whom Willdenow could but have been a compiler. With the *Filices*, which he lived to publish, he was practically conversant. His insertion of the essential generic characters, throughout these volumes, is an useful addition, and now become necessary in every similar undertaking.

Little can be said of Holland in this review of the botanical state of Europe for a few years past. The Leyden garden has always been kept up, especially during the life of the late Professor David Van Royen, with due care and attention; we know little of its fate in the subsequent convulsed state of the country. Botany has long been on the decline at Amsterdam, though we are indebted to that garden for having first received, and afterwards communicated to other countries, such acquisitions of Thunberg in Japan as escaped the perils of importation.

The botany of Switzerland may, most commodiously, be considered in the next place. Here, in his native country, the great Haller, after a long residence at Göttingen, was finally established. Its rich and charming *Flora* has been illustrated by his classical pen, with peculiar success. Everybody is conversant with the second edition of his work, published in 1768, in 3 vols. folio, and entitled, *Historia Stirpium Indigenarum Helvetiæ*, with its inimitable engravings, of the *Orchis* tribe more particularly. But few persons, who have not laboured with some attention at the botany of Switzerland, are

aware of the superior value, in point of accuracy, of the original edition of the same work, published in 1742, under the title of *Enumeratio Methodica Stirpium Helvetiæ Indigenarum*. This edition is indispensable to those who wish fully to understand the subject, or to appreciate Haller's transcendent knowledge and abilities. These works are classed after a system of his own, intended to be more consonant with nature than the Linnæan sexual method. We can scarcely say that it is so, on the whole; nor is it, on the other hand, constructed according to any uniformity of plan. The number of the stamens, compared with that of the segments of the corolla, or its petals, regulates the characters of several classes, and those are artificial. Others are assumed as natural, and are for the most part really so, but their characters are frequently taken from Linnæus, even from his artificial system, as the *Cruciatæ*, and the *Apetalæ*. Lord Bute has well said, that Haller was a Linnæan in disguise. His classification however was merely intended to answer his own purpose, with respect to the Swiss plants; for he was not a general botanist, nor had he a sufficiently comprehensive view of the subject to form a general system, or even to be aware of the difficulties of such an undertaking. He ought not therefore to be obnoxious to criticism in that view. His method has served for the use of his scholars, as the Linnæan one serves English botanists, by way of a dictionary. Some such is necessary; and those who should begin to decide on the merits of a system, before they know plants, would most assuredly be in danger of appearing more learned to themselves than to others. We cannot exculpate Haller from some degree of prejudice in rejecting real improvements of Linnæus, which are independent of classification; such as his trivial or specific names, by which every species is spoken of at once, in one word, mostly so contrived as to assist the memory, by an indication of the character, appearance, history, or use, of the plant. What did the great Swiss

botanist substitute in the place of this contrivance? A series of numbers, burthensome to the memory, destitute of information, accommodated to his own book only, and necessarily liable to total change on the introduction of every new-discovered species! At the same time that he rejected the luminous nomenclature of his old friend and fellow-student, who had laboured in the most ingenuous terms to deprecate his jealousy, he paid a tacit homage to its merit, by contending that the honour of this invention was due to Rivinus. In this he was not less incorrect than uncandid, the short names of Rivinus being designed as specific characters, for which purpose Haller knew, as well as Linnæus, they were unfit. Useful specific characters he himself constructed on the plan of Linnæus, with some little variation, not always perhaps for the better, as to strictness of principle, but often strikingly expressive. Here, as in every thing connected with practical botany, he shines. The most rigid Linnæan, whose soul is not entirely shrivelled up with dry aphorisms and prejudice, must love Haller for his taste and enthusiasm, and the Flora of Switzerland as much for his sake as its own. No wonder that his pupils multiplied, and formed a band of enthusiasts, tenacious of even the imperfections of their master. The line of demarcation is now no longer distinctly drawn between them and the equally zealous scholars of the northern sage. The amiable and lamented Davall strove to profit by the labours of both. The Alpine botanists of France and Italy have served to amalgamate the Swedish and the Helvetic schools. The Flora of Dauphiny by Villars is nearly Linnæan in system, and the principles of the veteran Belardi of Turin are entirely so; though he has been, in some of his publications, obliged to conform to the method of his late preceptor, the venerable Allioni, who, in spite of all remonstrance, had the ambition of forming a system of his own. His *Flora Pedemontana* is disposed according to this system, an unnatural and inconvenient

jumble of the ideas of Rivinus, Tournefort, and others. This work is also faulty in the neglect of specific definitions, so that its plates and occasional descriptions are alone what render it useful ; nor would it perhaps, but for the uncommon abundance of rare species, be consulted at all.

We may glance over the botany of Italy, to whose boundaries we have thus been insensibly led, as the eye of the traveller takes a bird's-eye view of its outstretched plains from the summits of the Alps. We may pass from Turin to Naples without meeting with any school of distinction. The northern states are not without their professors and patrons of botany, nor are their nobles destitute of taste in various branches of natural knowledge. The names of a Castiglione of Milan, a Durazzo and Dinegro of Genoa, and a Savi of Pisa, deserve to be mentioned with honour, for their knowledge and their zeal. The unfortunate Cyrillo, and his friend Pacifico, at Naples, were practical botanists. There is also a rising school, of great promise, at Palermo. But since the time of Scopoli, Italy has contributed little to our stock of information ; nor are the latter publications of this eminent man, while he resided at Pavia, commensurate in importance or merit with those earlier ones, the *Flora*, and *Entomologia Carniolica*, which have immortalized his name. Scopoli, who at first adopted a system of his own, had the sense and liberality, in his second edition, to resign it, in favour of what his maturer experience taught him to prefer, the sexual system of Linnæus.

Spain and Portugal claim our attention ; the former for being the channel through which the gardens of Europe have been, for some years past, enriched with many new Mexican and Peruvian plants ; and likewise as the theatre of the publication of some important books, relative to the botany of those countries. In speaking of American botany, we have mentioned the *Flora Peruviana*, whose authors, Ruiz and Pavon, rank deservedly

high for their industry and knowledge. The late Cavanilles, resident at Madrid, has also communicated to the learned world much information, from the same source. Spain seems anxious to redeem her reputation, which suffered so much from the neglect, or rather persecution, of the truly excellent but unfortunate Dombey, who, like many other benefactors of mankind, was allowed to make all his exertions in vain, and finally perished unknown, in the diabolical hands of English slave-dealers at Montserrat. Portugal is most distinguished at home by the labours of a learned benedictine, Dr. Felix Avellar Brotero, author of a *Flora Lusitanica*, disposed after the Linnæan method, reduced entirely to principles of number; and abroad by the valuable work of Father Loureiro, entitled *Flora Cochinchinensis*, in which the plants of Cochinchina, and of the neighbourhood of Canton, are classed and defined in the Linnæan manner, with valuable descriptions and remarks. It is undoubtedly a disgrace to the possessors of such a country as Brasil, that they have not derived from thence more benefit to the world, or to themselves, from its natural productions. But they are satisfied with what the bowels of the earth afford, and they neglect its more accessible, though perhaps not less valuable, treasures. The jealousy and innumerable restrictions of their Government render what they possess as useless to all the world as to themselves. A genius of the first rank in natural science, as well as in every thing which his capacious mind embraced, has arisen in Portugal, and has been domesticated in the schools of Paris and London, the amiable and learned Corrêa de Serra, now a traveller in the United States of America. What little impulse has been given to literature in Portugal, and particularly the foundation of a Royal Academy of Sciences, is owing to him; and though his name has chiefly appeared in the ranks of botanical science in an incidental manner, no one possesses more

enlarged and accurate views, or more profound knowledge, of the subject.

In the extensive, though incomplete, review which we have undertaken of the recent history of botanical science, the individual merits of particular writers have chiefly hitherto been detailed and compared. The most difficult part of our task perhaps still remains ; to contrast and to appreciate the influence and the merits of two great and rival nations, in the general school of scientific botany ; to consider the causes that have led to the particular line which each has taken, and to compare the success, as well as to calculate the probable future consequences, of their respective aims. England and France have, from the time of Ray and Tournefort, been competitors in botanical fame, because each was ambitious of supporting the credit of the great man she had produced. This contest, however, as far as it regarded theoretical speculations, has entirely subsided on the part of Ray's champions. In practical science, likewise, the admirers of Ray and of Tournefort have shaken hands, like those of every other school. On the subject of system, the question is greatly changed ; for though a phoenix has arisen from the ashes of Tournefort, its " star-like eyes," darting far beyond all former competition, have been met, if not dazzled, by a new light, rising in full glory from the north ; a polar star, which has been hailed by all the nations of the earth.

The Linnæan system of classification, with all its concomitant advantages of nomenclature, luminous technical definition, and richness of information, was planted, like a fresh and vigorous scion, in the favourable soil of England, already fertilized with accumulations of practical knowledge, about the middle of the last century. If we may pursue the metaphor, the ground was entirely cleared for its reception ; for all previous systems had been of

confined and local use ; the alphabetical index having become the resource of even the most learned ; and the pupils of Ray being held to his method of classification, rather by their gratitude for his practical instruction, than any other consideration. Accordingly we have, in our own early progress, before they were all, as at present, swept off the stage, found them rather contending for his nomenclature, imperfect as it was, because they were habituated to it, than for his system, of which, it was evident, they had made little use. Hence the first attempt in England to reduce our plants to Linnæan order, made by Hill, was chiefly a transposition of Ray's *Synopsis* into the Linnæan classes, the original nomenclature being retained, while the specific names of the *Species Plantarum* were rejected.

Hill's imperfect performance was superseded by the more classical *Flora Anglica* of Hudson, composed under the auspices and advice of the learned and ingenious Stillingfleet, in which the botany of England assumed a most scientific aspect, and with which all the knowledge of Ray was incorporated. At the same time, the principles of theoretical botany, and the philosophical writings of the learned Swede, were studied with no ordinary powers of discrimination and judgement, in a small circle of experienced observers at Norwich. A love of flowers, and a great degree of skill in their cultivation, had been long ago imported into that ancient commercial city, with its worsted manufacture, from Flanders ; and out of this taste, something like the study of systematic botany had sprung. These pursuits were mostly confined to the humblest of the community, particularly among the then very numerous bodies of journeymen weavers, dyers, &c. Towards the middle of the eighteenth century, several of the opulent merchants seem to have acquired, by their intimate connexion with Holland, not only the above-mentioned taste for horticulture, but likewise an ambition

to be distinguished by their museums of natural curiosities. The former sometimes extended itself, from the flowery parterre, and the well-arranged rows of tulips, hyacinths, carnations and auriculas, into no less formal labyrinths, or perhaps a double pattern of angular or spiral walks, between clipped hedges, exactly alike on each side of a broad gravel walk. Such was the most sublime effort of the art within the compass of our recollection. "Grove" could by no means be said to "nod at grove," for the perpendicular and well-trimmed structure was incapable of nodding; but that "each alley should have a brother" was an indispensable part of the design. Greenhouses of exotic plants, except oranges and myrtles, were at this time scarcely known; and the writer well recollects having seen, with wonder and admiration, above forty years ago, one of the first African Geraniums that ever bloomed in Norwich. If, however, the progress of natural science was slow in this angle of the kingdom, the wealthy manufacturers, become their own merchants, found it necessary to acquire a knowledge of various foreign languages, in order to carry on their wide-extended commerce. In learning French, Italian, Spanish, Dutch, and German, they unavoidably acquired many new ideas. Their sons were sent to the continent, and it were hard indeed if many of them did not bring home much that was worth learning. The society of the place, aided by some concomitant circumstances, and the adventitious acquisition of two or three men of singular talents and accomplishments, became improved. A happy mixture of literature and taste for many years distinguished this city above its rivals in opulence and commercial prosperity. Such Norwich has been in our memory; and if its splendour be gone by, a taste for mental cultivation, originating in many of the before-mentioned causes, still remains, and is fostered by the novel pursuits of chemistry and natural history, on which some arts, of great import-

ance in the manufactory of the place, depend for improvement. We trust the reader will pardon this digression from the subject more immediately before us, to which we shall now return.

Some of the more learned students of English plants, among the lovers of botany in Norwich, had long been conversant with the works of Ray, and even the *Historia Muscorum* of Dillenius. They were prepared therefore to admire, and to profit by, the philosophical writings of Linnæus. Hence originated the *Elements of Botany*, published in 1775, by Mr. Hugh Rose; who was aided in the undertaking by his equally learned friend, the Rev. Henry Bryant, of whose acuteness and botanical skill no better proof is wanting, than his having found and determined, nine years before, the minute *Tillæa muscosa*, for the first time in this island. Numerous pupils were eager to improve themselves by the assistance of such masters, and amongst others the writer of these pages imbibed, from their ardour and their friendly assistance, the first rudiments of a pursuit that has proved the happiness and the principal object of his life.

London became, of course, the focus of this science, as well as of every other. Of the English Universities, Cambridge most fulfilled its duty, in rendering its public establishments useful to the ends for which they were founded and paid. The names of Martyn, both father and son, have long maintained a distinguished rank in botany; and the latter, for many years, has inculcated the true principles of Linnæan science from the professor's chair. A botanic garden was established, by a private individual, Dr. Walker, about the period of which we are speaking. A Linnæan *Flora Cantabrigiensis*, by Mr. Relhan, has renewed the celebrity of that field, in which Ray had formerly laboured; and there has always existed a little community of Cambridge botanists, though fluctuating and varying, according to circumstances. At Oxford, botany, so vigorously established by Sherard and

Dillenius, slept for forty years under the auspices of the elder Professor Sibthorp, at least as to the utility of its public foundations. Yet even there the science had many individual cultivators, and if others were forgotten, the name of a Banks ought to render this school for ever celebrated. The younger Professor Sibthorp well atoned for the supineness of his father and predecessor. He published a *Flora Oxoniensis*, and extended his inquiries into the classical scenes of Greece, finally sacrificing his life to his labours, and sealing his love of this engaging study by a posthumous foundation, which provides for the publication of a sumptuous *Flora Græca*, and the subsequent establishment of a professorship of Rural Economy. Edinburgh, under the auspices of the late worthy Professor Hope, became distinguished for the cultivation of botany, as a branch of medical education. The physiology of plants was there taught, more assiduously than in almost any other university of Europe; and the Linnæan principles were ably enforced and illustrated, not with slavish devotion, but with enlightened discrimination. Nor must the dissenting Academy at Warrington be forgotten, where the distinguished circumnavigator Forster, of whom we have already spoken, was settled. Here many young naturalists were trained. The neighbouring family of the Blackburnes, possessed, even to this day, of one of the oldest and richest botanic gardens in England, have steadily fostered this and other branches of natural knowledge. The same taste has spread to Manchester, Liverpool, and the country around. Westmoreland, Northumberland, and Durham have their sequestered practical botanists, in every rank of life. Scenes celebrated by the correspondents of Ray are still the favourite haunts of these lovers of nature and science, who every day add something to our information, and to the celebrity of other parts of the same neighbourhood.

We must now concentrate our attention to the London school, which for about forty years past has maintained a

rank superior to most other seats of botanical science ; the more so perhaps for its being founded in total disinterestedness, both with respect to authority and emolument. Truth alone, not system, has been the leading object of this school ; unbiassed and gratuitous patronage its support ; and a genuine love of nature and of knowledge its bond of union, among persons not less distinguished from each other by character and opinion, than by their different pursuits, and various ranks of life. The illustrious Banks, from the time when, after his return from his celebrated and adventurous voyage, he devoted himself to the practical cultivation of natural science for the advantage of others, as he had long pursued it for his own pleasure and instruction, has been the head of this school. Here he fixed the amiable and learned Solander, for the remainder of his too short life. The house of this liberal Mecænas has ever since been, not only open, but, in a manner, at the entire command of the cultivators and admirers of this and other branches of philosophy ; inasmuch as his library and museum have been devoted to their free use ; and his own assistance, encouragement and information are as much at their service, as if his fortune and fame had all along depended on their favour. With such an establishment as this, aided by the perpetual resources of the numerous public and private gardens around, botany might well flourish. The liberal spirit of the leaders of this pursuit gave a tone to the whole. The owners of nurseries, though depending on pecuniary emolument for their support, rivalled each other in disinterested communication. The improvement of science was the leading object of all. One of this latter description took his rank among the literary teachers of botany. Lee's *Introduction* was much approved by Linnæus, whose system and principles it ably exemplifies, and who became the friend and correspondent of its author. Travelling botanists were dispatched, under the patronage of the affluent, to enrich our gardens from the Alps, the

Cape of Good Hope, and the various parts of America. Every new acquisition was scrutinized, and received its allotted name and distinction, from the hand of the correct and classical Solander, who one day was admiring with Collinson, Fothergill, or Pitcairn, the treasures of their respective gardens, and another labouring with the distinguished Ellis, at the more abstruse determination of the intricate family of marine productions, whether sea-weeds, corallines, or shells. His own acquisitions, and those of his friend and patron, in the fairy land of the South-Sea Islands, the hazardous shores of New Holland, or the nearly fatal groves and swamps of Java, were at the same time recorded by his pen, as they were gradually perpetuating by the slow labours of the engraver. To this band of zealous naturalists the younger Linnæus was, for a while, associated, as well as the excellent and zealous Broussonet, who, though not unversed in botany, devoted himself most particularly to the more uncommon pursuit of scientific ichthyology.

The Banksian school, altogether intent upon practical botany, had adopted the Linnæan system as the most commodious, while it pursued and cultivated the Linnæan principles, as the only ones which, by their transcendent excellence, could support the science of botany on a stable foundation. In these Dr. Solander was, of course, well trained ; and, having added so wide a range of experience to his theoretical education, few botanists could vie with him, who had, as it were, caught his preceptor's mantle, and imbibed, by a sort of inspiration, a peculiar talent for concise and clear definition. Abstract principles of classification, or even such outlines of natural arrangement as Linnæus had promulgated, seem never to have attracted Solander. In following the chain of his ideas, discernible in the materials he has left behind him, one cannot but remark his singular inattention to every thing like botanical affinity, to which the artificial sexual system was, with him, entirely paramount. The genera which, for extem-

poraneous use, he named with the termination *oides*, comparing each with some well-known genus, till a proper appellation could be selected, are seldom thus compared because of any natural affinity, nor scarcely any external resemblance, but because they agree with such in their place in the artificial system, or nearly perhaps in technical characters. A great botanist therefore, it is evident, may exist, without that vaunted erudition in a peculiar line, which some would have us consider as the only road to knowledge and to fame. We allow that this sort of erudition is now, since the attention it has received from Linnæus, Jussieu, and others, become indispensable to a good theoretical or philosophical botanist, as is the study of carpology, in consequence of the labours of Gærtner; we only contend that it is possible to know plants extremely well without either.

The learned Dryander, less skilled than his predecessor as the coadjutor of Sir Joseph Banks, in a practical acquaintance with plants, exceeded him in theoretical lore and ingenious speculation, and far excelled every other man in bibliographic information, as well as in the most precise fastidious exactness relative to every subject within the wide extent of his various knowledge. He furthered, upon principle, and with unwearied assiduity, every object of the noble establishment to which he was devoted; but he, like Solander, now sleeps with his fathers, and his place is supplied by a genius of British growth, who unites talents with experience, and theoretical skill, in the most eminent degree, with practical knowledge.

Although it is almost superfluous to name the most eminent disciples of the London school of botany, it might seem negligent to pass them over without some particular mention. The ardent and ingenious Curtis has left a permanent monument behind him, in the *Flora Londinensis*, to say nothing of the popular *Botanical Magazine*, continued by his friend Dr. Sims. The *Flora Scotica* of Lightfoot first offered, in a pleasing and fami-

liar garb, the botanical riches of that part of the island to its southern inhabitants. The lynx-eyed Dickson, so long and faithfully attached to his constant patron, has steadily traced, through all its windings, the obscure path of cryptogamic botany, with peculiar success. No more striking instance can be pointed out, to prove how totally the most consummate practical skill, even in the most difficult part of botany, is independent of theoretical learning. Even those who profit by the certain aids supplied by the discoveries of Hedwig, can with difficulty keep pace with this veteran in their pursuits, who, with conscious independence, neglects all those aids.

Just at the time when the school, whose history we are endeavouring to trace, had most firmly established its credit and its utility, a great additional weight was given to England, in the scale of natural science, by the acquisition of the entire museum, library, and manuscripts of the great Linnæus and his son, which came amongst us, by private purchase, in 1784, after the death of the latter. Hence our nomenclature has been corrected, and our knowledge greatly augmented. These collections have necessarily been consulted by most persons, about to publish on the subject of natural history; and a reference to them, in doubtful cases, secures a general conformity of sentiment and nomenclature, among the botanists of Europe, Asia, and America. We are seldom obliged to waste time in conjecturing what Linnæus, or the botanists with whom he corresponded, meant, for we have before us their original specimens, named by their own hands. An entire London winter was devoted to the almost daily labour, of comparing the Banksian herbarium throughout, with that of Linnæus, and to a copious interchange of specimens between their respective possessors, who, with the aid of Mr. Dryander alone, accomplished this interesting and instructive comparison. Hence the *Hortus Kewensis* of the lamented Aiton, which was at that period preparing for publication, became

much more correct in its names, than it, or any other similar performance, could have been, without this advantage. It could scarcely be imagined that Sweden would, unmoved, thus let the botanical sceptre pass from her; but it is much to the honour of the nation, that all her naturalists have ever preserved the most friendly intercourse with us, particularly with the person who deprived them of this treasure. They have not merely pardoned, but publicly sanctioned, the scientific zeal which prompted him to this acquisition, by associating him with all their learned establishments, without any solicitation on his part.

The institution of the Linnæan Society at London in 1788, especially under that name, must be considered as a triumph for Sweden in her turn. By this establishment the intercourse of science is facilitated; essays, which might otherwise have never seen the light, are given to the world; and a general taste for the pleasing study of nature is promoted. Learned and worthy people are thus made acquainted with each other, from the remotest corners of the kingdom, and their information enriches the common stock. The state has given its sanction to this rising establishment. Its publications and its members are spread over the Continent, and other similar institutions have borrowed its name, imitated its plan, and paid respect to its authority. Yet it is not in the name alone of Linnæus, that the members of this Society place their confidence; still less do they bow to that name or to any other, at the expense of their own right of private judgement. Their Transactions are open to the pupils of every school, and the observations of every critic, that have any prospect of being useful to the world. The writer of each communication, must, of course, be answerable for the particulars of his own performance, but the Society is responsible for each being, on the whole, worthy to be communicated to the public. The possession of the very materials with which Linnæus worked, his own specimens

and notes, enables us very often to correct mistakes, even of that great man, many of which would be unaccountable without the means of thus tracing each to its source. At the same time, the acquisition of materials to which he never had access, tends to improve and augment the history of what he had left imperfect. His language, his definitions and characters were, for some time, held so sacred, that they were implicitly copied, even though manifestly inapplicable, in some points, to the objects to which they were referred. Synonyms were transcribed from his works by Rose, Hudson, Curtis, and even Gærtner, (we assert it on the positive proof of errors of the press, copied in the transcribing,) without reference to the original books, to see whether such synonyms, or their accompanying plates, agreed with the plant under consideration. The example of Dr. Solander first led the writer of this to avoid such a negligent and unfaithful mode of proceeding; yet he has ever considered as sacred the very words of Linnæus, where they require no correction. They are become a kind of public property, the current coin of the botanical realm, which ought not, with impunity, to be falsified or adulterated. To them we hope to be pardoned if we apply the words of the poet,

“The solid bullion of one sterling line,
Drawn to French wire, would through whole pages shine.”

Of this it is needless to quote examples. We must be every day more and more sensible of the value of the Linnæan style, in proportion as the number of those who can attain it is evidently so very small. By the light of our master alone can the science, which he so greatly advanced and refined, be preserved from barbarism, while long and tedious, loose and feeble, ill-contrasted and barbarously-worded definitions, press upon it from various quarters. New terms are invented to express old ideas; names and characters are changed for the worse, to conceal the want of new discoveries; and students are often deterred from

adopting real improvements, because they know not which guide to prefer.

From the combined effects of the various causes which we have endeavoured to trace, the study of botany in England has, for a long period, been almost entirely practical. To determine the particular species intended, in every case, by Linnæus; to distinguish and to describe new ones; to improve scientific characters, and to correct synonyms; these have been the objects of our writers; and hence many publications of great utility, especially a number of critical and descriptive essays, in the Transactions of the Linnæan Society, not unworthy of the school which gave them birth, have enriched the general stock of knowledge. These are the sound fruits of skill and investigation, the solid advantages of real information, applied to practical use. They are independent of theoretical speculation, and will stand unshaken, amidst any possible changes of system. On such principles the *Flora Britannica* has been attempted, and continued as far as the present unsettled state of some of the latter orders, of the last class, will allow. Such impediments, which depend on the difficulties of systematic discrimination, among the Lichens especially, it is hoped will soon be removed. Meanwhile the *English Botany* of the same writer, illustrated by Mr. Sowerby's expressive and scientific figures, has finished its course, and formed so nearly complete a body of local botany, as, we believe, no other country has produced. In this the liberal contributions of numerous skilful observers, from the alpine heights of Scotland to the shores and circumambient ocean of the south, are preserved and recorded; evincing a degree of general inquiry and acuteness, which hardly any nation can rival. The memory of several benefactors to the science, otherwise in danger of passing away, is embalmed in this national work, which serves at once as their botanical testament, and the monument of their fame. Some of our botanists of the present day have thrown great light

on several of the most obscure departments of the science ; witness Mr. Sowerby's work on *English Fungi* ; the labours of the learned Bishop of Carlisle on *Carices*, and, in conjunction with Mr. Woodward, on *Fuci* ; of Mr. Dawson Turner on the latter tribe, and on the *Musci* of Ireland ; but especially Mr. Hooker's inimitable display of the British *Jungermannia*. Nor shall the contributions of a Winch or an Abbot, a Withering, Knapp, Stackhouse or Vellee, nor the more splendid labours of the indefatigable Lambert, be forgotten. Each, in one way or other, has enlarged the bounds of science, or rendered it easier of access. We cannot, in the compass of our present undertaking, pay the tribute due to every individual, our aim being a general picture of the whole. From what we have said, the zeal with which this lovely science has been cultivated in England will sufficiently appear. Nor have public lectures, or botanic gardens, been neglected, in order to render the knowledge of botany as accessible as possible, and to diffuse a taste for its pursuit. The popularity of the study has, at least, kept pace with the means of instruction. The garden and green-house, the woods, fields, and even the concealed treasures of the waters, are now the resource of the young and the elegant, who in the enjoyment of a new sense, as it were, in the retirement of the country, imbibe health, as well as knowledge and taste, at the purest of all sources.

France alone now remains to be considered, in order to finish the historical picture which we have undertaken, of the state of botanical science in Europe. To do justice to this part of our subject, we must turn our attention to times long since gone by, or we shall scarcely render intelligible the state of affairs at present.

The great Tournefort, by the force of his character, his general and particular information, the charms of his pen, and the celebrity which his name gave to his country, through the popularity of his botanical system, was so firmly established, in the ideas of the French, as the *Grand*

Monarque of botany, that they would have as soon allowed the greatness of Louis XIV. to be questioned, as that of this distinguished philosopher. So beneficial was this partiality, in some respects, that it gave an unprecedented impulse and popularity to the science ; so disadvantageous was it in others, that it placed a formidable barrier in the way of all improvement. Vaillant, the able and worthy pupil of Tournefort, has never been forgiven for speaking, on some occasions, too freely of his master's defects. Hence his own merit has been kept in the background. The doctrine of the sexes of plants was discountenanced as long as possible, because it was proved by Vaillant, after having been rejected by Tournefort. Nevertheless, when the good seed of science is once sown, it can hardly be totally suffocated by the impediments of prejudice and ignorant partiality. Practical zeal sprung up by the side of speculative jealousy, and the tares withered, while the profitable plants flourished. Some botanists followed the steps of Tournefort to the Levant, exploring afresh those countries which he has for ever rendered classic ground. Others visited America, which they traversed in different directions. The indefatigable Plumier performed three separate voyages to the western world, and though his discoveries have, in a great measure, suffered shipwreck from tardy and imperfect patronage, as a great part of his collections did by the accidents of nature, yet something of value remains. His *Filices* are enough to insure his perpetual remembrance, and his *Nova Genera* are the basis of our knowledge of generic differences in West Indian plants. Most of all has been distinguished, among the French botanists who succeeded the times of Tournefort and Vaillant, the family of the Jussieus. One of these investigated the prolific regions of Peru, and discovered some things which no succeeding traveller has gathered ; other branches of this family, besides being eminent in medical science and practice, have pursued the study of botany with no ordinary success, on the most

philosophical principles. Of these the most eminent are the celebrated Bernard de Jussieu, the contemporary of the earlier days of Linnæus; and his nephew Antoine Laurent de Jussieu, the pride and the ruler of systematic botany at present in France. The views and the performances of these great men lead us to a new branch of our subject, which indeed we have had in our contemplation from the beginning of this essay, the exposition of the principles of a natural scheme of botanical classification, as hinted, and imperfectly sketched, by Linnæus, and brought to the perfection of a regular system by the Jussieus.

Previous to our entering on this detail, and the remarks to which it will give rise, we must conclude all that belongs to the former part of our undertaking, by giving some account of those botanists who have formed and maintained a Linnæan school in France. We must shelter ourselves under the broad banner of truth when we observe that these have, till very lately, been almost the only French botanists that have supplied us with any practical information; and their labours have been useful in proportion as they have commendably shaken off the prejudices of their predecessors. Of this last proposition Duhamel is a witness, though we may perhaps excite some surprise in classing him among Linnæan botanists. His preface to his *Traité des Arbres* sufficiently shows how fearful he was of being taken for such, and yet how he was held by vulgar prejudice alone, to the nomenclature, or rather the generical opinions, of Tournefort. He tells us, while he adopts these, that his judgement went with Linnæus, whom he follows in all new discoveries. The plan of his book, confined to hardy trees and shrubs, justifies his use of an alphabetical arrangement, in preference to any system, unless he had thought sufficiently well of Tournefort's to prefer that. But he has prefixed to his work, as a practical method of discovering scientifically what it contained, no other than a sexual classifi-

cation. His practical botany was so limited, being entirely subservient to his great objects, of forest planting and vegetable physiology, that he had no attention to spare for the consideration of methodical systems. Accordingly he tells us, that some such is necessary for the use of botanists, especially of those who explore the productions of foreign countries, but whether the method of Ray, Tournefort, Boerhaave, Van-Royen, Linnæus, or Bernard de Jussieu be adopted, is of no importance. Six years before Duhamel's work came out, Dalibard had published, in 1749, his *Floræ Parisiensis Prodrômus*, according to the Linnæan system.

It has always appeared to the writer of this, from the conversation and writings of French botanists, that the judgement of the learned Le Monnier, and the countenance of his patron the Duke D'Ayen, afterwards Marechal de Noailles, first established the reputation of Linnæus in France ; not so much possibly for the sake of his system, as his discoveries, his commodious nomenclature, and his clear principles of discrimination. When Le Monnier botanized in Chili, in the company of the astronomers with whom he was associated, he soon found, like Dr. Garden in South Carolina, that the classification of Tournefort was no key to the treasury of a new world. He however made his remarks and collections, and studied them subsequently under the auspices of a more comprehensive guide. The Marechal de Noailles, a great cultivator of exotic trees and shrubs, corresponded with the Swedish naturalist, and endeavoured to recommend him to the notice of the lovers of plants in France. Meantime Gerard and Gouan in the south, both introduced themselves to the illustrious Swede, and promulgated his principles and discoveries, though only the latter adopted his classification. Villars we have already noticed as the author of a Linnæan *Histoire des Plantes de Dauphiné*. He died lately, Professor of Botany at Strasburgh, where he succeeded the very able and philosophical Hermann, one of the truest

Linnæans, who had imbibed all the technical style of the Swedish school, as well as its accuracy of discrimination. We may now safely announce Hermann as the real author, in conjunction perhaps with Baron Born, of that ingenious but bitter satire the *Monachologia*, in which the several *species* of monks are affectedly discriminated, and their manners detailed, like the animals in the Linnæan *Systema Naturæ*. This ludicrous performance has long since appeared in a, not very exact, English translation, and was rendered into French by the late M. Broussonet. As we are led again to name this amiable man, too soon lost to his country, after experiencing every vicissitude of revolutionary péril and alarm, we cannot help distinguishing him as one most zealous in the cultivation and diffusion of Linnæan learning, a taste for which he chiefly imbibed in England. He had no indulgence for those prejudices, which cramped the talents of his countrymen, and prevented their deriving knowledge from any quarter where it was to be had. He recommended the younger Linnæus to their personal acquaintance and favour, which service he also rendered, a few years after, to the person who now commemorates his worth, and who will ever remember, with affection and regret, his many virtues, his agreeable converse, and his various and extensive acquirements.

The intimacy which subsisted between this enthusiastic naturalist, and the distinguished botanist L'Heritier, confirmed, if it did not originally implant, in the mind of the latter, that strong bias which he ever showed for the Linnæan principles of botany. According to these his numerous splendid works are composed. He moreover imbibed, if we mistake not, from the same source, a peculiar preference for uncoloured engravings of plants, instead of the coloured ones which had long been in use. It cannot be denied that the merit of these last is very various, and sometimes very small. They do, nevertheless, present to the mind a more ready idea of each species, than a simple engraving can do, nor is the latter less liable

to incorrectness. When plates are taken from the delineations of such exquisite artists as L'Heritier employed, they have a good chance of excellence; but the engravings of Cavanilles, done after miserable drawings, though they deceive the eye by their neat finishing, are really less exact than many a rude outline. Coloured plates, if executed with the uniformity and scientific exactness of Mr. Sowerby's, or the characteristic effect of Jacquin's, speak to the eye more readily than most engravings. The art of printing in colours, practised formerly in England with small success, was revived at Paris by Bulliard, and is carried to the highest perfection in the recent publications of Redouté and Ventenat, which leave hardly any thing to be wished for, with respect to beauty or exactness. Many of the works of L'Heritier have remained imperfect, in consequence of the political convulsions of his country, and his own premature death. The learned and worthy Desfontaines, who travelled in Barbary, has been more fortunate in the completion of his labours. His elegant *Flora Atlantica*, in 2 vols. 4to, with finely engraved uncoloured plates, is classed and modelled on the plan of the Linnæan school. Such also is the plan of the works of that distinguished botanist La Billardiére, who, besides his account of New Holland plants, has published five elegant *decades* of new species from Syria. That scientific horticulturist M. Thouin, likewise a most excellent botanist, though he has scarcely written on the subject, is a correct pupil of the Swedish school. His general spirit of liberal communication, and his personal attachment to the younger Linnæus, led him to enrich the herbarium of the latter with the choicest specimens of Commerson's great collection, destined otherwise to have remained in almost entire oblivion. A singular fate has attended the discoveries of most of the French voyagers, such as Commerson, Sonnerat, and Dombey, that, from one cause or other, they have scarcely seen the light. So also it has happened to those of Tournefort, Sarrazin, Plumier, and

others, whose acquisitions have long slept in the Parisian museums. Happily there seems to have arisen of late a commendable desire to render them useful by publication, and thus many fine plants, known merely by the slight and unscientific appellations of Tournefort, and therefore never adopted by Linnæus, have recently been clearly defined, or elegantly delineated. The journeys of Olivier and Michaux towards the east have enriched the Paris gardens, and been the means of restoring several lost Tournefortian plants. We believe however that the English nurseries have proved the most fertile source of augmentation to the French collections, as appears by the pages of all the recent descriptive writers in France.

We dare not presume to arrange the indefatigable and very original botanist Lamarck among the Linnæan botanists of his country; but we beg leave to mention him here, as one who has thought for himself, and whose works are the better for that reason. His severe and often petulant criticisms of the Swedish teacher, made him appear more hostile than he really was, to the principles of that great man. Being engaged in the botanical department of the *Encyclopédie Méthodique*, he was obliged to conform to an alphabetical arrangement; but he surely might have chosen the scientific generic names for that purpose, instead of barbarous or vernacular ones, which, to foreigners, would have made all the difference between a commodious and an unintelligible disposition of his work. In the detail of his performance, he has great merit, both with respect to clearing up obscure species, or describing new ones, and he had the advantage of access, on many occasions, to Commerson's collection. Lamarck's *Flore Française*, is arranged after a new analytical method of his own. This book however is valuable, independent of its system, as an assemblage of practical knowledge and observation. We have only to regret a wanton and inconvenient change of names, which too often occurs, and which is not always for the better; witness *Cheiranthus*

hortensis, instead of the long established *incanus* of Linnæus ; *Melampyrum violaceum*, which is not correct, for *nemorosum*, which is strictly so, and which preserves an analogy with the rest of the species.

We shall now undertake the consideration of the principles that have been suggested, and the attempts that have been made, respecting a

Natural Classification of Plants.

The sexual system of Linnæus lays no claim to the merit of being a natural arrangement. Its sole aim is to assist us in determining any described plant by analytical examination. The principles on which it is founded are the number, situation, proportion, or connexion, of the stamens and pistils, or organs of impregnation. These principles are taken absolutely, with the sole exception of their not being permitted to divide the genera, that is, to place some species of a genus in one part of the system, and others in another, though such may differ in the number, situation, proportion, or connexion of their stamens or pistils ; those characters being possibly artificial, while the genera are supposed, or intended, according to a fundamental law independent of all systems, to be natural assemblages of species. We need not here explain the mode in which Linnæus has provided against any inconvenience in practice, resulting from such anomalies of Nature herself.

But though this popular system of Linnæus does not profess to be a natural method of classification, it is, in many points, incidentally so, several of its classes or orders whose characters are founded in situation, proportion, or connexion, being more or less perfectly natural assemblages ; nor can it be denied that, on the whole, it usually brings together as many groups of natural genera, as occur in most systems that have been promulgated. This fact would be more evident, if the various editors of this

system, those who have added new genera to the original ones of Linnæus, or, in general, those who have any way applied his method to practice, had properly understood it. They would then have perceived that its author had always natural affinities in view; his aim, however incompletely fulfilled, according to our advanced knowledge, having constantly been, to place genera together in natural affinity or progression, as far as their relationship could be discerned. At the same time he uses an analytical method, at the head of each class in his *Systema Vegetabilium*, in which the genera are disposed according to their technical characters. Murray, in compiling the fourteenth edition of that work, has been inadvertent, respecting this essential part of its plan. Indeed it is probable that he was not competent to judge of the affinities of the new genera, introduced from the *Supplementum*, or from the communications of Jacquin, Thunberg, &c. Yet surely he might have perceived the affinity of *Banksia* to *Protea*, rather than to *Ludwigia* or *Oldenlandia*; and indeed Linnæus himself ought to have discovered the relationship of the latter to *Hedyotis*, if he did not detect their identity, instead of inserting it between two such strict allies of each other as *Ludwigia* and *Ammannia*. To pursue these remarks would be endless. It is hardly necessary to indicate the natural classes, or orders of the Linnæan system, such as the *Tetradynamia*, *Didynamia*, *Diadelphia*, *Syngenesia*; the *Triandria Digynia*, *Gynandria Diandria*, &c. Except the first-mentioned class, which, if *Cleome* be removed, is strictly natural and entire, the others are liable to much criticism. We are almost disposed to allow, what we know not that any one has yet observed, that the system in question is the more faulty in theory, for these classes being so natural as they are. Each order of the *Didynamia* presents itself as a natural order, though the character of that class, derived from the proportion of the stamens, serves to exclude several genera of each order, and to send them

far back, into the second class. If all ideas of natural affinity be discarded from our minds, there is no harm whatever in this ; but if the *Didynamia* claims any credit, as a class founded in nature, the above anomaly is a defect. So, still more, under the same point of view, is the *Diadelphia*, or at least its principal order *Decandria*, liable to exception. This order consists entirely of the very natural family of *Papilionaceæ*. They are characterized as having the ten stamens in two sets. Now it happens that there are many papilionaceous genera, indeed a great number of such have been discovered since Linnæus wrote, whose ten stamens are all perfectly distinct. These therefore are necessarily referred to the class *Decandria*, and they come not altogether amiss there, because they meet, in that class, some concomitant genera, which though, like them, leguminous, are less exactly, or scarcely at all, papilionaceous. But the greatest complaint lies against some genera of the *Diadelphia Decandria*, for having the stamens all really combined into one set, so as in truth to answer to the technical character of the preceding class, *Monadelphia*. There is mostly indeed some indication of a disunion upward, where they, more or less perfectly, form two sets ; and some of them are so nearly diadelphous, that their complete union at the bottom may easily be overlooked ; others, however, have only a fissure along the upper side of their common tube, without any traces of a separate stamen or stamens. The papilionaceous character of the *corolla* therefore, in such cases, is made to overrule that of the particular mode of union among the stamens, and is in itself so clear, as seldom to be attended with any difficulty ; but the incorrectness of principle in the system, in the point before us, as being neither professedly natural, nor exactly artificial, cannot be concealed. Part of the objections, to which the sexual system was originally liable, have been obviated. We mean what concerns the last class but

one, *Polygamia*. Dr. Forster observed, in his voyage round the world, that this class was subject to great exception, on account of the trees of tropical climates, so many of which are constantly or occasionally polygamous; that is, each individual frequently bears some imperfect flowers, male or female, along with its perfect or united ones. Such a circumstance reduces any genus to the class *Polygamia*; and on this principle Mr. Hudson, thinking perhaps that he made a great improvement, removed our *Ilex Aquifolium*, or Holly, thither, though *Ilex* is well placed by Linnæus in the fourth class. The author of the present essay has ventured to propose a scheme, which is adopted in his *Flora Britannica*, for getting clear of this difficulty. He considers as polygamous such genera only as, besides having that character in their organs of impregnation, have a difference of structure in the other parts of their two kinds of flowers. Thus *Atriplex* has, in its perfect flowers, a regular spreading calyx, in five equal segments; in the attendant female ones a compressed one, of two leaves, subsequently much enlarged.

The genera thus circumstanced are so very few, as far as we have discovered, that possibly the class might, but for the uniformity of the system, be abolished. We cannot indeed tell what future discoveries may be made; and its character, on the above foundation, is sufficiently clear and permanent; for flowers of an essentially different configuration, can hardly vary into each other. The orders of the last class of the Linnæan system, *Cryptogamia*, are natural, and preserved, all nearly the same, by every systematic projector. The original appendix to this system, the *Palmæ*, would be a great blemish therein, as an artificial arrangement: for such an arrangement ought to be so formed as to admit every thing, on some principle or other. But this stumbling-block is now removed. The palm tribe were placed thus by themselves, merely till their fructification should be sufficiently known.

Now they are found to agree well with some of the established classes and orders, where they meet with several of their natural allies.

Whatever advantages might accrue to the practical study of botany, from the convenience and facility of his artificial system, Linnæus was from the beginning intent on the discovery of a more philosophical arrangement of plants, or, in other words, the classification of nature. This appears from the 77th aphorism of the very first edition of his *Fundamenta Botanica*, published in 1736, where he mentions his design of attempting to trace out fragments of a natural method. In the corresponding section of his *Philosophia Botanica*, he, fifteen years afterwards, performed his promise; and the same *Fragmenta*, as he modestly called them, were subjoined to the 6th edition of his *Genera Plantarum*, the last that ever came from his own hands. The interleaved copies of these works, with his manuscript notes, evince how assiduously and constantly he laboured at this subject, as long as he lived. He was accustomed to deliver a particular course of lectures upon it, from time to time, to a small and select number of pupils, who were for this purpose domesticated under his roof. What this great botanist has himself given to the world, on the subject under consideration, is indeed nothing more than a skeleton of a system, consisting of mere names or titles of natural orders, amounting in his *Philosophia* to 67, besides an appendix of doubtful genera; and that number is, in the *Genera Plantarum*, reduced to 58.

Under the title of each order, the genera which compose it are ranged according to the author's ideas of their relationship to each other, as appears by some of his manuscript corrections; and some of the orders are subdivided into sections, or parcels of genera more akin to each other than to the rest. He ingenuously avowed, at all times, his inability to define his orders by characters. He conceived that they were more or less connected with

each other, by several points of affinity, so as to form a map, rather than a series. The experienced botanist, who peruses the above-mentioned *Fragmenta*, will in most cases readily imbibe the ideas of their author, as to the respective affinities of the genera. In some few instances, as the *Dumosæ*, where he avows his own doubts, and the *Holeraceæ*, where he is unusually paradoxical, it is more difficult to trace the chain of his ideas. Such however was all the assistance he thought himself competent to afford. His distinguished pupils Fabricius and Giseke fortunately took notes of his lectures on natural orders ; and by the care of the latter, to whom Fabricius communicated what he had likewise preserved, their joint acquisitions have been given to the public, in an octavo volume at Hamburgh, in 1792. Nor was this done without the permission of their venerable teacher, who told Giseke by word of mouth, when they took leave of each other, that “as he loved him, he had laboured with pleasure in his service ;” adding, that “Giseke was at liberty to publish, whenever he pleased, any thing that he had retained from his own instructions.”

Linnæus, according to a conversation with Giseke, recorded in the preface of the volume edited by the latter, declined to the last any attempt to define in words the characters of his orders. His reason for this appears in his *Classes Plantarum*, where he justly remarks, that no certain principle, or key, for any such definition can be proposed, till all the orders, and consequently all the plants, in the world are known. He has however so far expressed his opinion, in the work last quoted, as to point out the situation of the seed itself, with respect to other parts, and the situation and direction of its vegetating point, or *corculum*, as most likely to lead to a scheme of natural classification. Hence the system of Cæsalpinus stood very high in his estimation. He also, in the conversation above mentioned, divides his own orders into three sections or classes, *Monocotyledones*, comprising the first ten

orders, with the 15th ; *Dicotyledones* (with two or more cotyledons), the 11th to the 54th order, inclusive, except the 15th; and *Acotyledones*, order 55th to 58th, with a hint that the last, or *Fungi*, ought perhaps to be altogether excluded. This distribution of plants, by the number or the absence of the cotyledons, or lobes of the seed, is the great hinge of all the professedly natural modes of arrangement that have been attempted. We shall for the present not enter on the consideration of this principle, as it will more properly be explained when we examine the system of Jussieu. Linnæus did not consider it as absolute, for he told Giseke that he knowingly admitted into his 11th order some plants that are monocotyledonous, with others that are dicotyledonous. The reason of this was the only secret he kept from his pupil, nor could the latter ever dive into it, though he afterwards endeavoured to learn it from the younger Linnæus, who knew nothing, neither did he, as Giseke says, much care, about the matter. We hope to be able to throw some light upon this mystery, when we come to the order in question.

The want of any avowed principle of distinction, precludes all criticism of these natural orders of Linnæus, as a regular system ; we can therefore only take a cursory view of them as they follow each other, with such indications of their characters as Giseke has recorded, or as we may ourselves be able to trace. A great part of the substance of the lectures, published by him, consists of remarks on the genera of each order, as to their mutual distinctions ; with numerous botanical and even economical matters, which do not all come within the compass of our present consideration. What we have to lay before the reader, is not, in any manner, forestalled, by what he will find in the fourth volume of the *ENCYCLOPÆDIA*, above cited, which is taken from a different source.

Order 1. *PALMÆ*. “ An entirely natural and very distinct order.” This tribe of plants, stationed by nature

within the tropics, is considered by Linnæus as the original food of man ; still supplying the place of corn to the inhabitants of tropical countries. Palms are the most lofty of plants, and yet it is a matter of doubt whether they ought to be called trees or herbs. They do not form wood in concentric circles, year after year, like our trees, though they are extremely long-lived. The author of the sexual system was, as we have just mentioned in speaking of that system, but little acquainted at first with the structure of the flowers of palms, or the number of their stamens or pistils. His predecessors in the establishment of genera of plants, Tournefort and Plumier, had published little or nothing illustrative of this tribe. He had himself seen no more than three or four species in fructification, nor had he any other resource, in founding genera, than the plates of the *Hortus Malabaricus*, (excellent indeed, but not delineated with any particular view of this kind,) and the less complete representations of Rumphius. The growth of these plants is quite simple. Each terminates in a bud, of a large size, called the heart, or by voyagers in general the cabbage, of the palm. When this is cut off, the tree dies, though the growth of many centuries. This bud has a gradual and nearly continual vegetation, unfolding its leaves, which Linnæus rather incorrectly terms fronds, one after another in succession, not all at any particular season. The bud therefore is perennial, not, as in our trees, annual, nor can it, for this reason, be renewed. Fresh buds, in time becoming trees, are furnished from the generally creeping, perennial, and deeply descending roots. What have commonly been denominated the branches of palms, Linnæus very properly declined calling so, because they never increase by producing lesser branches. He objected to calling them leaves, “because they are each attended by no separate annual bud, neither have they the texture of ordinary leaves, nor do they wither and fall off at any particular season.” He adopted the term *frond*, which

he always used when he could not decide whether the part in question were a branch, leaf, or stem. We cannot but think these are truly leaves, though it must be confessed they differ from the generality of such, in being destitute of any line of separation by which they are capable of falling, or being thrown off, from the stem. In this they agree with the foliage of *Musci* and *Jungermannia*; there being a perfect continuity of substance throughout. The hardened torn fibres, or rather vessels, which remain on the stems of palms, where the leaves have once been, are precisely the same as what occur in various mosses; and something similar may be observed in many liliaceous plants and their allies, which approach to the nature of palms.

In describing the fructification of this order, Linnæus considered as belonging thereto, what we should presume to be rather the inflorescence. Hence the great branching flowerstalk retains, in a technical sense, the name of *spadix*, derived from the ancients; and its ample containing sheath is denominated a *spatha*. The latter is reckoned a kind of calyx, as the former a sort of branched common receptacle. Linnæus strengthens his terminology in this case, by tracing an analogy between the *spatha* of palms, and the glume of grasses. We doubt whether any such particular analogy exists. Neither does his other comparison, of the part in question to the sheath of a *Narcissus* and its allies, at all, as far as we can judge, elucidate or confirm his principle. He surely swerves in these instances, as well as in his generic distinctions of the umbelliferous plants, from the correctness of an axiom, on which botany as a philosophical science depends, that generic characters, and much more those of classes and orders, should be exclusively derived from the parts of fructification. Surely a very slight consideration of the flowers and fruits of the *Palma*, as we have become acquainted with them since the time of Linnæus, will abundantly satisfy any person, that they afford clear cha-

racters, on which to found a sufficient number of distinct and very natural genera. Even that author, in the lectures before us, records that some genera have a three-leaved *calyx*, others none at all; some have a *corolla* of three, others one of six, petals; most have six *stamens*, some three, others nine, while the *Nipa* of Thunberg has only one. The *germens* are three in some, solitary in others, and the *style* and *stigma* are subject to like diversity in different genera. The *fruit* is in some, as the *Phœnix dactylifera*, or Date, a single drupa, in others composed of three; in some, like the Cocoa, a nut with a coriaceous coat. The *seeds* are mostly solitary, but in several instances two or three in each fruit. Hence, while the fructification affords sufficient materials for discriminating genera, Linnæus observes that no common character, exclusively descriptive of the whole order, can be founded upon it. The reader will find the essential characters of his genera in our Vol. IV. 288. His *Zamia*, concerning which he avowed considerable doubts, chiefly because it wanted a *spatha*, is now by common consent among botanists, removed either to the Ferns, or to an intermediate order between them and the Palms, to which also *Cycas* belongs. The technical characters which have induced this alteration, are confirmed by circumstances attending the habit and qualities of these genera.

At the end of his proper *Palmæ*, Linnæus subjoins in a distinct section, three genera, which he was doubtful whether to leave there, or to establish as a distinct order. These are *Stratiotes*, *Hydrocharis*, and *Valisneria*. He remarks in his lectures that “they have a *spatha* extremely like the palms; a calyx of three leaves, and a corolla of three petals; leaves perennial and evergreen, folded when they first come forth. *Hydrocharis* cannot be separated from *Stratiotes*, nor *Valisneria* from *Hydrocharis*. They produce their leaves crowded together at the base, like Ferns. Although their strict affinity with the larger Palms of India cannot be demonstrated, they

ought nevertheless to be associated therewith. They are all aquatics, whence we may presume that India may afford some aquatic palms, smaller than the others, which may prove a connecting link between the latter and the plants of which we are speaking." Giseke points out several palms, in various authors, which though but imperfectly ascertained, confirm this conjecture of his preceptor. Linnæus in his own copy of the *Genera Plantarum*, enriched with his manuscript notes, to which we shall often refer, has marked this section, or appendage, of his *Palmæ*, as distinguished by "an inferior fruit, with many seeds." He has moreover added 4 genera to this assemblage, *Pandanus*, *Bromelia*, *Tillandsia*, and *Burmannia*. Giseke has amply illustrated the order of *Palmæ*, by observations of his own, or those of various writers; but the most solid acquisitions to our knowledge, in this interesting tribe, are derived from the labours of Dr. Roxburgh, in his *Plants of Coromandel*.

Order 2. PIPERITÆ. "The plants of this order have an acrid flavour, whence the name." They afford no common character to discriminate the order, except possibly the elongated receptacle and sessile anthers, but some *amentaceæ* have the same. They consist of *Zostera*, *Arum*, and its allies, *Orontium*, *Acorus*, *Piper*, and *Saururus*. The last is removed by Linnæus in his manuscript to his 15th order.

Order 3. CALAMARIÆ. "These are closely related to the true grasses, and have almost the same kind of leaves. Their seed is solitary and naked; stamens three; style one, not unfrequently three-cleft at the summit. Their glume is of one valve (whereas most grasses have two valves), except *Schænus*, which bears several valves irregularly disposed, though in other respects so near the rest of its order, as scarcely to be distinguished without accurate examination of the parts alluded to. The stem of these plants is a *culm*, mostly triangular, rarely round, often leafless, or nearly so. Leaves rather rigid and rough.

Flowers often disposed in an imbricated manner. Seed in a few instances surrounded with bristles. When these are extended into a kind of wool, hanging out beyond the scales, such a character marks the genus *Eriophorum*." Linnæus asserts that "*Scirpus* differs from *Carex*, in having all the flowers united, whereas in the latter some scales are accompanied with stamens only, others with pistils;" but he forgot the tunic, or *arillus*, of the seed, which makes the essential and clear character of *Carex*. He mistakes also in supposing the stamens are always three in this order; in several instances they are but two, in a few they are solitary. Much has been done respecting the genera and species of this order by Rottboll, Vahl, Brown, Schrader, and others. Linnæus has made a manuscript correction in the *Calamariæ*, excluding from thence *Typha* and *Sparganium*, which he would remove to the preceding order, principally, it seems, because he judged the latter to be very closely allied to *Zostera*; as well as on account of its anthers, but we can trace no resemblance in those to the *Piperitæ*. On the contrary they and their filaments agree with the *Calamariæ*. The stamens of *Typha* indeed are somewhat different, and Mr. Brown, in his *Prodromus Floræ Novæ Hollandiæ*, has anticipated this alteration of Linnæus.

Order 4. GRAMINA. "The true Grasses compose as peculiar a family as the Palms. They are the most common plants in the world, making about a sixth part of the vegetable kingdom, especially in open situations. There they multiply, and extend themselves by their creeping roots, prodigiously. In confined and woody places they scarcely creep, but stand erect. They are the most important of all vegetables, for this reason, that they are the chief support of such animals as depend on vegetable food. They make the verdure of our summers, and the riches of rustic life. Their leaves are not easily hurt by being trampled on, and though the severity of winter may wither and fade them, so that in the early spring no ap-

pearance of life remains, yet they revive. The solicitude of the Author of Nature, for the preservation of this important tribe of vegetables, appears from their flowering stems being rendered unfit for the food of cattle, that nothing may hinder the perfecting of their seeds. Besides, the more they are cut and ill-treated, the more vigorously they grow, propagating themselves proportionably underground; and in order that they may be enabled to thrive any where, their narrow leaves are so contrived, as to insinuate themselves between the divisions or branches of other herbs, without any mutual impediment. There are very few grasses agreeable to our palate. For the most part they are insipid, like pot-herbs; a very small number being fragrant. None are nauseous or poisonous. Grasses are the most simple of all plants; having scarcely any spines, prickles, tendrils, stings, bractees, or similar appendages to their herbage."

"Their stem is termed a *culm*, being hollow, composed of joints which are separated by impervious knots. In our quarter of the world the culm is usually simple, unless in consequence of cutting away the flowering part; in the Indies most culms are branched. The leaves are mostly alternate, always undivided, and generally flat on both sides, with a rough edge, and either smooth or hairy surface. Each leaf stands on a sheath, which embraces the stem, and is crowned with a membrane, sometimes termed *ligula*, closely embracing the stem, to hinder the admission of water. The sheath springs from a knot, and (with its membrane) answers the purpose of a stipula."

"The fructification of Grasses differs so much from that of other plants, that it was supposed impossible to reduce them to scientific order. They were first distinguished into corn and grasses; but such a distinction is founded merely on the comparatively larger seeds of the former, on which we depend for food, as small birds do on the very minute seeds of the latter. Ray was the first botanist who undertook a regular examination of grasses.

He distributed them according to their outward appearances, but distinctive characters failed him. Neither was Tournefort, however great a botanist, equal to the arrangement of this tribe. Monti followed Ray, but investigated such only as were natives of Italy. John Scheuchzer, first induced by Sherard, paid a most laborious attention to this subject, collecting grasses from all quarters, and describing them with the greatest exactness; but he was deficient in technical terms, and his very long descriptions are nearly all alike, till he arrives at the flowering part. The terms which he uses are *folliculus* for the corolla, *gluma* for the calyx, *locusta* for the spikelet contained in the latter. After him Micheli contrived a new method, dividing grasses according to their spikelets, which he observed to be either compound or simple. He subdivided them by their flowers being united or separated; and subjoined an order of plants "akin to grasses," which really do not belong to them. If their sexes be attended to, the arrangement of grasses becomes less difficult. They are either *monandrous*, *diandrous*, *triandrous*, or *hexandrous*. The two latter have either united, monoecious or polygamous flowers."

"The inflorescence in this order of plants is either spiked or paniced. Their spike, properly so called, consists of several flowers, placed on an alternately toothed *rachis*, or stalk. If such a rachis be conceived perfectly contracted, it will become a toothed common receptacle, as in compound flowers, so that grasses may thus be distinguished into simple and compound. Or if we imagine all the flowers to be sessile on one common base, such grasses as are properly spiked will have a scaly receptacle, the rest a naked one, according to the analogy of the syngenesious class; and by this means the corn family may be separated from the rest, for they are scaly.

"The calyx is a husk of two valves, one proceeding from within the base of the other, like the claw of a crab. These husks are concave, and truly the leaves of the plant

in miniature. The calyx contains one, two, or more, florets, which are constructed in the same manner, of two leafy husks, called by Linnæus petals, to distinguish them from the former. Within the petals the receptacle bears two very minute, roundish, pellucid, extremely tender, withering scales, often invisible without a magnifier, which Micheli termed petals, Linnæus nectaries. Stamens generally three, in a few one, two, or six with capillary filaments, and oblong incumbent anthers, whose lobes become separated at each end. Micheli erroneously imagined those which have six stamens, to bear, as it were, doubled flowers. The germen is superior, with two styles, sometimes raised on a common stalk or elongated base, and they are usually reflexed to each side, being either longitudinally hairy, or tufted at the summit only. Seed universally solitary, without a capsule, *Lygeum* only having a nut, of two cells, which is very singular. A few have a simple style, as *Zea*, *Nardus*, and *Lygeum*. The seed is occasionally coated by the petals, which closely enfold it, and are almost united with it,—witness *Hordeum* and *Avena* ;” (to which examples indicated by Linnæus we may add *Briza*). “Many grasses are furnished with an awn, *arista*, mostly rough, like a prominent bristle, inserted into the back of the outermost petal, either at the bottom, middle, summit, or a little below the latter. This appendage is either straight, or furnished with a joint, and twisted backward, or simply recurved ; in some it is woolly : in several it is accompanied by hairs at the base of the corolla. The use of these parts is to attach the ripe seeds to the coats of animals, that they may be the more dispersed.”

“Although grasses are destitute of spines properly so called, a few have their leaves longitudinally involute, in such a manner that their rigid permanent points have all the properties of thorns, as in *Spinifex*, and some *Festucæ*. Their foliation is, for the most part, involute, but in some instances, as *Dactylis glomerata*, it is folded. This cha-

racter has not as yet received sufficient attention, but ought to be noticed in future, as it may throw great light on the distribution of the family of plants in question. Very few indeed are furnished with setaceous leaves."

Order 5. TRIPETALOIDEÆ. "Scheuchzer and other authors have referred *Juncus* and its allies to Grasses, under the title of *Graminibus affines*. In truth, they are so similar to grasses, as scarcely to be distinguishable without fructification. The genera are *Juncus*, *Aphyllanthes*, *Triglochin*, *Scheuchzeria*, *Elegia* and *Restio* in the first place, then *Flagellaria*, *Calamus*, *Butomus*, *Alisma* and *Sagittaria*." Linnæus, in his manuscript, has hinted, that the three latter may possibly belong to the above-mentioned section at the end of his *Palmæ*; see Ord. 1.

Order 6. ENSATÆ. "So called from the form of their leaves, resembling a sword, being perfectly simple, almost linear, alternate, mostly converging by the margins, often cloven longitudinally, so that the edge of one leaf embraces the other, thus constituting what is termed equitant foliage. The root in many cases is oblong and fleshy, lying flat on the ground, or creeping. But some species of *Iris* are truly bulbous, like *Crocus*, *Ixia*, *Antholyza*, &c. Stem, in these genera, simple, erect, zig-zag; but in *Commelina*, especially the annual kinds, it is branched, as in *Tradescantia*. *Crocus* and *Bulbocodium* have no stems. Leaves usually sword-shaped; very rarely quadrangular; in the bulbous species of *Iris* involute; in not a few *Commelinæ* ovate; in *Xyris* and various kinds of *Eriocaulon* awl-shaped. *Fulcra*, or appendages, are scarcely to be found in this order. The calyx is a *spatha*, though but of a spurious kind, being mostly a large concave valve, resembling a halved sheath in *Iris*; most beautiful in *Commelina*, where it is heart-shaped. In *Sisyrinchium* however this part is more perfectly bivalve. Corolla generally of six petals; though in *Iris* so united by their claws, as to constitute a monopetalous corolla. In *Commelina* and *Tradescantia* the petals are very distinct, but the three

inferior being ruder in texture, and smaller, resemble a calyx. Style with three stigmas, except some *Commelinæ*. Pericarp a capsule of three cells and three valves, with many seeds; generally inferior, but not so in *Commelina*, *Tradescantia*, and *Callisia*. Hence it follows that this order affords no certain mark, on which a distinctive character could be founded."

Order 7. ORCHIDÆ. "Orchis is a most ancient generic appellation, alluding to the testicular shape of the roots, in many plants of this family, which have, at all times, been believed to possess a stimulating or aphrodisiacal virtue. All the *Orchideæ* might be comprehended in one genus, in which light also the *Umbellatæ*, *Semiflosculosæ*, *Papilionaceæ*, might each likewise be considered. But the science would be overwhelmed in confusion by such extensive genera, which it is therefore found necessary to subdivide.

"Many *Orchideæ* have a tuberous fleshy root; not properly to be termed bulbous, because its fibres are thrown out from the top, or crown, whereas true bulbs produce their fibres from the base. These tubers, or knobs, are mostly in pairs; some of them globose and undivided, others palmate, like the hand. One of these tubers, from whence the plant of the present year has come, being exhausted, will swim in water; the other, destined to blossom next season, is so solid as to sink. In the palmate kinds, the former is vulgarly called the hand of the Devil, the latter the hand of God. *Ophrys corallorrhiza* however has a threadshaped, branched, and jointed root; that of *O. bifolia* is perfectly fibrous. In other genera, particularly *Epidendrum*, the root consists of clusters of fibres."

"The stem is solitary and herbaceous, except in several kinds of *Epidendrum*, quite simple, often leafy. In some however there is merely a leafless, radical flower-stalk, generally round, though not so in *Ophrys Loeselii* and *paludosa*. The leaves are simple, alternate, undi-

vided, sheathing the stem ; sometimes wanting, as in *Orchis abortiva*. Appendages none at all, except bractes. Inflorescence terminal, either spiked or racemose. Fructification irregular, and very singular, for it is impossible to say what is calyx, and what corolla ; nor is this point of much importance, nature having placed no limits between them. There are five petals ; besides a nectary, which makes, as it were, a sixth. These five seem to constitute an upper lip, the nectary an under one. Or it may be said that the corolla is composed of three outer, often ruder petals ; and three inner, the lowermost of which ought rather to be denominated a nectary. This last is various in different genera, having its appropriate figure and dimensions, while the rest of the petals are more uniform. Sometimes the middlemost of the five petals, composing the upper lip, (like that of a ringent or helmet-shaped flower,) is more erect and dilated ; but I have received some species from the Cape of Good Hope, in which these petals are united to each other, and elongated at their common base into a spur. Such will constitute a new division or genus, of this family, as it stands in the *Species Plantarum*, many of which have a spur from the base of the lower lip, or nectary. The petals however do not afford sufficient distinctions, for genera or species. The former are determined by the nectary, which is for that purpose principally to be regarded. There is indeed no occasion to advert to any other part than the flower of these plants, for distinguishing either genera or species. Vaillant therefore, and Seguir, have contented themselves with delineating their various flowers alone."

"The stamens consist of two anthers, nearly without filaments, very singular, and peculiar to this order, concealed in a double pouch or hood, but their pollen has not been ascertained. They are 'contracted at the base, naked, or destitute of a skin, divisible like the pulp of an orange, and covered each by a cell open underneath, in-

serted into the inner margin of the nectary ;' as described in the *Genera Plantarum*. It remains therefore for inquiry, whether the anthers burst in these as in other stamens, and whether the pollen explodes upon the female organs ? or whether there be any internal communication between the anthers and germen ?" This latter opinion Linnæus was inclined to adopt, because, (as he thought,) "the pistil was so obscure, that no one was able to say whether there were any style or stigma." We cannot but remark here that the latter is sufficiently apparent, in the form of a shining glutinous depression or cavity, just below the anthers ; nor is there any doubt that the pollen, though different in texture from other plants, and various in the different species of these, performs the office of impregnation by the stigma. It consists of naked elastic or granular masses, being what Linnæus terms the anthers.

"The germen is inferior in the whole order ; the style short, inclining, in many hardly manifest, in some American *Orchideæ* very conspicuous. Stigma either obsolete, or funnelshaped, sometimes compressed. A small gland moreover is present, suspected to belong to the female organs of impregnation, but not very decidedly." (Linnæus surely errs in asserting that the sexes of the plants in question are very obscure.) "The fruit is a capsule, of one cell, and three valves, which last are connected by a lateral suture, to which the seeds are attached, as to a receptacle. The capsule does not burst in the usual manner, but the valves separate at their lateral sutures, while their extremities remain united at top and bottom. The seeds are numerous, of a chaffy appearance, like saw-dust."

"Many fine species of this order are found in Europe and America ; the Cape of Good Hope is not rich in them ;" (Mr. Brown observed a considerable number there ;) "both Indies abound with singular ones, especially with *Epidendra*. Their favourite soil is a spongy,

moist, friable, rich, but not manured, earth, in rather shady situations. The species of *Epidendrum* are all, perhaps, parasitical, insinuating their roots into the bark of aged trees."

"*Orchideæ* are extremely difficult of culture." We refrain from transcribing the ideas of Linnæus on this subject, as it is now known that some of these plants may be propagated by seed, and that several succeed very well in our stoves, among the rotten bark of trees, accompanied by fresh vegetable mould. Our wild Orchises are best removed when in full bloom, when the mould should be entirely cleared away from their roots, and the latter planted immediately in fresh sifted soil from their native place of growth, with moderate subsequent watering. Thus treated they will come up and flower for many successive years in the same pot.

Order 8. SCITAMINEÆ. "These nearly approach the *Orchideæ* in aspect. The name of the order is an ancient word, synonymous with *aromatic*, and answers to the whole of the tribe, except *Musa*, *Heliconia*, and *Canna*." (The two former certainly do not belong to this order, and the last but imperfectly.)

"The roots of the *Scitamineæ* are fleshy, mostly acrid and aromatic, lying on the surface of the ground, and throwing out fibres from their under side, like some of the 6th order. Stem always quite simple," (to this there are exceptions in *Maranta*,) "in some bearing alternate leaves; in others naked, and separate from the foliage. Leaves lanceolate, quite entire, even, stalked, convoluted contrary to the direction of the sun; their stalks sheathing the stem. Inflorescence either a spike or cluster, the flowers being separated by coriaceous or membranous bracteas. Flower superior. Calyx a perianth of three valves. Corolla always irregular. Pericarp in most instances a capsule of three cells and three valves, with many seeds in each cell." We pass over much of the Linnæan description, recent discoveries having enabled

succeeding writers, particularly Mr. Roscoe, in *Trans. of Linn. Soc.* vol. viii., and Mr. Brown in his *Prodr. Nov. Holl.*, to explain the flowers much better. The corolla is monopetalous, with a double limb, and more or less irregular; each limb in three deep segments; the inner most unequal, one of its segments being a dilated, lobed, ornamented lip, like that of the *Orchideæ*, the other two sometimes very small, or obsolete. Stamen one, inserted into the tube, opposite to the lip; its filament mostly dilated, and of a petal-like habit, by the diversity of whose shape Mr. Roscoe has first reduced this order into natural genera, a matter in which preceding botanists had altogether failed. The anther consists of two parallel distinct lobes, united lengthwise with the filament, bursting longitudinally, sometimes spurred at the base. There are usually the rudiments of two abortive stamens, first asserted to be such by Mr. Brown. Germen roundish, with a threadshaped style, lodged between the lobes of the anther, and a dilated, cup-like, often fringed, stigma.

“To this order belong the Ginger, Cardamoms, Grains of Paradise, *Costus*, Galangale and Zedoary of the shops, all aromatic. We have nothing similar to them in Europe, except *Acorus*.”

What Professor Giseke has subjoined to the lectures of Linnæus, relative to this order, is, to say the best of it, superfluous.

Order 9. SPATHACEÆ. “These are distinguished by their bulbous root, consisting of a radical bud, formed from the bases of the last-year’s leaves, which envelope the rudiments of the future foliage. In a bud the scales are expanded into leaves; in a bulb the permanent base of the leaves becomes fleshy. In this order the leaves are sheathing at the root, so that they exhibit no instance of a scaly bulb, but only a coated one. Their leaves are, with a few exceptions, almost linear, or linear lanceolate. Stem no other than a *scapus*, or radical flowerstalk, either round, two-edged, or triangular. The *spatha*, or sheath, is a

terminal membrane, splitting lengthwise, except in *Hæmanthus*, where it divides into six segments, resembling an involucre, and is permanent. The *spatha* sometimes contains many flowers, and where it naturally bears but one, is liable occasionally to produce more. The flowers are stalked within the *spatha*; in most instances they are superior, but not in *Bulbocodium*, whose corolla is divided to the very base. This plant therefore has erroneously been referred to *Colchicum*. *Tulbaghia* has a perfectly inferior flower, but cannot be referred to *Hyacinthus*, on account of its many-flowered *spatha*." (The nectary, or crown of the tube, abundantly distinguishes it.) "*Allium* has invariably an inferior flower, but its *spatha* shows that it belongs to the order before us. Some of its species bear flowers as big as a *Narcissus*."

"The corolla in most of the genera is monopetalous, inasmuch as the nectariferous tube bears the petals. Otherwise they might all be denominated hexapetalous, except *Colchicum* and *Crinum*; to say nothing of *Gethyllis*, distinguished from all the rest by its very long tube. Stamens six, except in the genus last mentioned, where they are twice that number. Pistil one, except *Colchicum*; but many have a three-cleft stigma, so that in *Colchicum* this part may be considered as only further divided even down to the germen. Capsule in all of three cells, with many seeds." (*Hæmanthus* has a berry.)

"The roots of this tribe grow best if they are dried after the leaves perish, either artificially, or by the arid nature of their place of growth. Many of these roots are nauseous and acrid, therefore poisonous, especially *Colchicum*. The bulb of a *Narcissus* will kill a dog. No analogy holds good between these plants and the Tulip, whose bulb may be eaten with impunity; because they are not of the same natural order. All the species of *Allium* are impregnated with their own peculiar pungent flavour, and nature being disposed to expel them with violence from the stomach, they prove most powerful su-

dorifics. Much of the substance of these last-mentioned is mucilaginous, which involves and separates their acrid particles. Hence they are not dangerous in substance, but their expressed juice, deprived of viscidness, is fatal."

Order 10. CORONARIÆ. "A coronary or garland flower was anciently such as, on account of its beauty, was used for ornamental wreaths."

"*Ornithogalum* has much in common with *Allium*, but wants the *spatha*. *Scilla* is so nearly related to *Ornithogalum*, that they are scarcely to be distinguished but by the breadth" (some say the proportion) "of their filaments. *Hyacinthus* and *Scylla* are with difficulty distinguishable, though the latter has six petals, the former a monopetalous six-cleft corolla, but this is in some instances so deeply divided as nearly to approach the latter."

"In this order the root is either tuberous, a solid bulb, or, as in *Lilium*, a scaly one. The leaves of *Aloe*, *Yucca*, *Agave*, and *Bromelia*, are, as it were, a bulb above ground, whose dilated, fleshy, permanent scales remain year after year; just as the bulb of the Lily consists only of the perennial bases of the foliage. In the *Aloe* tribe, not merely the base, but the whole leaf is perennial. Whoever is ignorant of this, cannot fail to go astray in studying the order in question."

"The stem is simple, often a mere *scapus*, occasionally leafy, in consequence of a partial elevation of the radical leaves."

"The flower, destitute of *spatha* or any sort of calyx, consists of six petals." (Linnæus terms them such, because they fall off when the flowering is over.) "In *Ornithogalum* some species have the under side of the corolla green, which part therefore is permanent here, as consisting of corolla and calyx united. In some kinds of *Anthericum*, and in *Veratrum*, the petals are likewise permanent, but in a faded condition. The stamens are universally six, three of them interior. Germen superior.

In *Aloe* the pistil is solitary, and three-cleft; but the style is divided to the very base into three parts in *Melanthium*, *Helonias*, *Veratrum*, and one species of *Ornithogalum*. All the tribe have a capsule of three cells, and three valves, the seeds being placed one above another."

"There is no uniformity in the qualities of the *Coronariæ*, there being among them a great diversity of scent. The nauseous smell of *Fritillaria imperialis* and *Veratrum* indicates a very poisonous quality, of which likewise *Aloe* partakes. *Lilium* is mild; its root inodorous and mucilaginous; its qualities therefore are emollient and lubricating. *Scilla maritima* is in the highest degree acrid and diuretic, dissolving viscid humours. The root of *Ornithogalum umbellatum*, as well as of *O. luteum*, is eatable. The former appears to be the Dove's dung, sold for so high a price during the siege of Samaria, as recorded in the Second Book of Kings, chap. vi. ver. 25; in the first place, because it is very abundant in Palestine, whence the English call it Star of Bethlehem; secondly, because the flower resembles the dung of pigeons and other birds, in its greyish and white partycoloured hue, whence also comes the name *Ornithogalum*, or bird's milk, alluding to the white substance, always accompanying the dung of these animals; and lastly, because the root in question is to this day eaten in Palestine, at least by the poor." (See *English Botany*, t. 130.)

"Wepfer has proved by many experiments, the very poisonous nature of the root of the Crown Imperial, which kills dogs, wolves, and various other animals. The ancients relate that the honey of its flowers caused abortion. No flower, except *Melianthus*, produces more of this fluid, yet the bees do not collect it! We owe this fine plant, now so common, to Clusius, who more than two hundred years ago received it, along with the Horse-Chestnut, from the east. He likewise acquired many other bulbs before unknown, now become the ornaments of our gardens. From his time no one has taken the same pains. Certainly if

any person could travel, for this object, into the interior of Persia and the kingdom of the Mogul, he would be likely to obtain many superb plants of this order, as recent travellers to the Cape of Good Hope have made us acquainted with so many novelties among the *Ixiæ*, *Antholyzæ*, &c. of which Hermann, Oldenland, &c., their predecessors, have not mentioned a word. *Tulipa Gesneriana* is so called, because it was procured by Conrad Gesner, from Cappadocia, whence it has become common throughout Europe: its endless varieties are the delight of florists, and some of them fetch a high price."

Linnæus in his own manuscript has, as we have already said, removed *Bromelia*, *Tillandsia*, and *Burmannia*, from this order to the *Palmæ*, or at least an appendix thereto.

Order 11. SARMENTACEÆ. "Sarmenta among the ancients meant unarmed, prostrate, weak branches, unable to support themselves; hence this name is applied to the order before us, many plants belonging to which answer to that character, being of a long, weak, trailing or twining habit. The *Sarmentaceæ* are monocotyledonous. They differ much in fructification, and may be variously arranged; either by their calyx and corolla; the number of their stamens or of their pistils; the nature of their fruit; or the inferior and superior situation of their germen. Hence it appears that no common character, applicable to the whole order, can be deduced from the fructification."

"*Raiania*, *Tamus*, *Dioscorea*, *Smilax*, *Cissampelos*, *Menispermum* and *Ruscus*, form one assemblage, all except the last having the above-mentioned kind of stem, twining to the left, not to the right, except in one species of *Menispermum*. Such a difference is rare between plants of the same natural order. *Smilax* supports itself by two tendrils, springing from near the base of the footstalks; all the rest are spiral, and without examination of the fructification, may easily be confounded. The above are

dioecious, except one or two species of *Ruscus*." (*Centella* ranged among these in *Gen. Pl.* is now referred to *Hydrocotyle*.)

"*Dracæna*, *Asparagus*, *Convallaria*, *Uvularia*, *Gloriosa* and *Erythronium*, compose another section. The last is intermediate, as it were, between the present order and the *Coronariæ*. *Gloriosa simplex* is a small plant, not unlike *Erythronium*, with reflexed petals." (What Miller, who is Linnæus's sole authority for this species, intended, nobody has ever been able to make out.)

"*Medeola*, *Paris* and *Trillium* have whorled leaves, except *M. asparagoides*, which scarcely differs from the genus *Asparagus*, except in having three styles instead of one."

Aristolochia, *Asarum* and *Cytinus*, nearly akin to each other, are removed from this order by the author in his manuscript, to the 27th, *Rhoeadeæ*, but not without a query. In the same place we meet with what may perhaps prove a solution of the mystery, which Giseke was so anxious to unriddle, and to which we have already alluded in the beginning of this part of our subject. Linnæus has here mentioned *Nymphæa*, as having in some of its species one cotyledon, in others two. He notes also that *Menispermum* and *Aristolochia* are dicotyledonous. *Nymphæa* however appears to be the great secret which the worthy professor told his pupil that he or some other person might chance to find out in ten, twenty or fifty years, and would then perceive that Linnæus himself had been aware of it. Accordingly, Gærtner and Jussieu have made the same discovery, or rather, fallen into the same mistake; describing *Nymphæa* as monocotyledonous, and *Cyamus* Sm. Exot. Bot. v. i. 59. (their *Nelumbo*, or *Nelumbium*), as in some measure dicotyledonous. The excellent De Candolle, in the *Bulletin des Sciences*, n. 57, published in 1802, has first rightly considered both as dicotyledonous, and akin to the *Papaveraceæ* of Jussieu, the Linnæan *Rhoeadeæ*.

Linnæus, in his lectures, proceeds to observe, that he “wanted to make further inquiry into the cotyledons of his *Sarmentaceæ*; for though he knew that several of these plants were monocotyledonous, he knew two, and did not doubt there were more, perfectly dicotyledonous. Hence he suspected the order might be separated into two, in other respects very closely related.”

“The roots of all this family are oblong and fleshy, except *Erythronium*, whose radicles are long and quite simple; those of *Smilax Sarsaparilla* run very deeply into the ground, and are sometimes so thickened at the ends as to become tuberos. The stem at first coming forth is smooth and leafless, mostly branched, except in *Paris* and *Trillium*; in some prostrate. Leaves in every instance simple and undivided, sometimes linear, sometimes lanceolate and acute, or heartshaped, uniform, mostly alternate; except when three or more stand together in a whorl, and in *Dioscorea oppositifolia*. It is rare that alternate and opposite leaves occur in the same natural order. Flowers mostly on simple stalks, *Smilax* excepted, which has umbels; they are drooping, except in *Paris*. Stamens universally six, except in *Menispermum*. Styles three, or three-cleft. All the genera, almost without exception, are deficient in either calyx or corolla. The fruit is generally of three cells. Inflorescence axillary in all except *Erythronium*, which has but one flower, and *Ruscus*, where it springs from the leaf.”

“Their qualities are to be judged of by the smell. All of them betray something of malignity, except two insipid ones which are eatable, *Dioscorea* and *Asparagus*. *Gloriosa* is very poisonous; the dried flowers of Lily of the Valley cause sneezing, like *Veratrum*, that is, they produce convulsions. *Paris* has always been deemed poisonous. One kind of *Cissampelos*, named *Pareira brava*, and *Smilax*, are known by physicians to be highly diuretic, as well as the roots of *Asparagus*. *Menispermum Cocculus* kills fishes, lice, and men.”

“ This whole order is entirely without pubescence, even the prickly *Smilaxes*.”

Next follow the Dicotyledonous Orders.

Order 12. *HOLERACEÆ*, pot-herbs, (erroneously printed *holoraceæ* in *Gen. Pl.*, which has misled several writers). “ This denomination is given to plants that are tender or brittle in the mouth, and easy of digestion, like many of the order before us.” The order is divided into several sections. Of the first *Blitum*, *Atriplex*, *Chenopodium*, *Salsola*, *Salicornia*, &c. are examples. The second consists of *Petiveria*, *Calligonum*, *Ceratocarpus* and *Corispermum*. *Callitriche* was subsequently removed to the 15th order. In the third section *Axyris* stands alone. Of the fourth *Herniaria*, *Illecebrum*, *Amaranthus*, *Phytolacca*, may serve to give an idea. The fifth begins with *Begonia*, (of whose affinity Linnæus candidly confesses his ignorance, and to which no botanist has yet found an ally). Next follow *Rumex*, *Rheum*, *Polygonum*, &c. The sixth section has *Nyssa*, *Mimusops*, *Rhizophora*, *Bucida* and *Anacardium*; and the seventh *Laurus*, *Winterana* and *Heisteria*; in both which the fleshy receptacle appears, where he could trace it, to have guided Linnæus to an arrangement evidently paradoxical, which he labours, without satisfying us, to justify.

Order 13. *SUCCULENTÆ*. “ Bradley wrote on Succulent Plants, by which he meant such as could not be preserved in a *Hortus Siccus*. When gathered, vegetables of this nature will live, often for a whole year, flowering as they hang up in a house, and throwing out roots afterwards if planted. All such plants, however, do not enter into the present order. *Stapelia*, *Euphorbia*, and *Aloe* are excluded. The *Succulentæ* grow, and become very turgid, in the driest soil, nor are any found in watery places. If moistened too much they perish, and their roots decay. They afford, in putrefying, a fine vegetable mould, whereas dry plants, like heath and fir, scarcely yield any.”

Linnæus has distinguished these into four sections. In the first are *Cactus*, *Mesembryanthemum*, *Tamarix*, and others. *Nymphæa*, placed here in the Linnæan manuscript, as well as in Giseke's publication, was afterwards removed by Linnæus to his *Rhoeadeæ*. *Sarracenia* he conceived to be akin thereto. In his second section are *Sedum* and its numerous allies; in the third *Portulaca*, *Claytonia*, &c.; and in the fourth a very different assemblage, as we should think, composed of *Saxifraga*, *Adora*, &c. and even *Hydrangea*. Linnæus however thought all these sections nearly related. "They are," says he, "succulent, insipid, inert, and inodorous, therefore mere pot-herbs, widely different from the other fleshy plants, *Stapelia*, &c. whose fructification is so unlike them, and whose qualities are so poisonous. We find in this order, that opposite or alternate leaves is an indifferent circumstance. These plants have no true spines, no tendrils, nor climbing stems, neither stipulas nor bracteas." (Giseke well remarks, that *Sedum acre* is one exception to their alleged insipidity, though we can scarcely agree with him that *Sempervivum tectorum* is another.)

Order 14. GRUINALES. The best-known genera here are *Linum*, *Drosera*, *Oxalis*, *Geranium* and its relations. Linnæus admits also *Quassia*, *Zygophyllum*, *Averrhoa*, &c., and his editor inserts, with well-founded doubt, *Sparmannia*. Their roots and habits are various. Calyx usually of five leaves, and corolla of five petals. Stamens various in number and connexion. Pistils mostly five or ten. Fruits various. Linnæus professed himself unable to define the character of this order. Many of the plants have acid leaves.

Order 15. INUNDATÆ. "So called because they grow in water, many of them under its surface, except their blossoms." *Potamogeton* is the genus most generally known, to which Linnæus suspected *Orontium* to be related, but not correctly. *Myriophyllum*, *Proserpinaca*, *Hippuris*, &c. are placed here, and even *Elatine*, notwithstanding its numerous seeds. *Chara* and *Najas* form a

section at the end. *Callitriche*, *Lemna*, and even *Pistia*, were proposed to be brought hither ; with *Saururus* and *Aponogeton*.

“ The qualities of the *Inundatæ* are very obscure. These plants are mostly inodorous, except a fishy scent in some ; nor have they any particular taste ; hence they are not used medicinally.”

This order is out of its place with respect to the arrangement by the cotyledons, of which Linnæus seems aware, from the remarks subjoined to it, in his lectures, concerning that principle. To these we shall hereafter refer.

Order 16. CALYCIFLORÆ. This consists of *Osyris*, *Trophis*, *Hippophæe* and *Elæagnus*. No observation relative to it is given in the lectures, except that these genera are removed elsewhere. A manuscript note before us indicates a suspicion of its relationship to the 6th section of the *Holeraceæ*. Linnæus sometimes referred *Mecylon* to one of these orders, sometimes to the other, but finally to his 18th ; we should rather presume it belongs to the 19th notwithstanding the definite number of the stamens, which caused Jussieu to range this genus with the Linnæan *Calycanthemæ* ; see the next order.

Order 17. CALYCANTHEMÆ. “ The title of this order is precisely synonymous with the last, and is applicable in a different manner to the different genera of which the present consists. In those whose germen is inferior, the calyx bears the flower and enfolds the germen ; in those where the latter is superior, it is unconnected with the calyx, into which the stamens are, in that case, inserted, like the *Senticosæ* and *Pomaceæ*, not into the receptacle. The germen is inferior in *Epilobium*, *Oenothera*, *Gaura*, *Jussiaea*, *Ludwigia* and *Isnarda*, as well as in *Mentzelia* and *Loosa*” (or *Loasa*) ; “ in the rest, *Ammannia*, *Grislea*, *Glaux*, *Peplis*, *Frankenia*, *Lythrum*, *Melastoma*, *Osbeckia*, and *Rhexia*, it is superior. Some genera have four, others five or six petals. *Glaux* and *Isnarda* have none. *Ammannia* and *Peplis* have occasionally petals,

or not, in the same plant. *Melastoma* has a berry; the rest a capsule, usually of four or five cells, in some genera of but two, or one." Linnæus mentions *Melastoma* as the only arboreous genus. The rest are herbaceous, (rarely shrubby,) with opposite or alternate leaves; stamens from four to twelve, pistil always solitary, the stigmas either four or one.

"These plants are mostly inodorous and insipid, except a styptic property in the root of *Lythrum*; none of them are used in the shops. It is remarkable in this order particularly, that some flowers are sessile and axillary, but towards the summit the leaves gradually diminish, and are finally obliterated, so that the inflorescence becomes a spike, as may be seen in *Epilobium*."

Order 18. BICORNES. "So called," by Linnæus, "from the anthers, which in many of this tribe terminate in two beaks. The plants are rigid, hard and evergreen, almost all more or less shrubby; certainly perennial. *Diospyros* is arboreous. The leaves of this order are alternate, simple, undivided, scarcely crenate, permanent. Stipulas and bractæas wanting;" (certainly not always the latter). "Calyx of one leaf, more or less deeply four or five cleft. Corolla usually monopetalous; in *Pyrola*, *Clethra*, and their near allies, pentapetalous. Nectaries none, except in *Kalmia*." (Linnæus can here mean only the pouches which for a while detain the elastic stamens, and those are by no means nectaries.) "Stamens from four to ten, answering to the divisions of the corolla, or twice their number. Pistil 1, except *Royena*, which is digynous. Germen in some superior; in others, as *Vaccinium*, inferior. Some have a capsule, others a berry; the cells of each four or five; but *Diospyros* has a fruit of eight cells. The seeds are either one or many in each cell, mostly small, chaffy." Linnæus remarks that "they can scarcely be raised in a garden, especially as the plants are many of them natives of boggy situations;" but our English gardeners are masters of their treatment,

witness the abundance of *Ericæ* from the Cape, now common in every greenhouse, and many other charming shrubs, cultivated in a peat soil. He conceived the whole order to be nearly confined to one meridian, from the North Cape of Lapland, to the Cape of Good Hope ; but he is incorrect in saying there are very few in North America, and none in the East or West Indies.

Halesia, *Styrax*, *Spathelia*, *Citrus* and *Garcinia* are subjoined as an appendix to the *Bicornes*, but there is allowed to be a considerable distance between them, and the last is erased in the *Gen. Plant.* as having opposite leaves. Giseke records, p. 345, that when Linnæus said no *Erica* grew in America, he asked him whether *Hudsonia* were not an exception to this ? On which he took that genus from his herbarium, and after contemplating and replacing it, wrote something, Giseke knew not what, in his *Genera Plantarum*. We find what he wrote to be as follows: “ *Videnda Hudsonia, Empetrum, Ilex, Itea.*” It is interesting to be thus able to trace the thoughts of such a man. He was moreover correct as to the genus *Erica* itself, of which no species has been detected in America.

Order 19. *HESPERIDÆ*. Of this nothing is said in the lectures. The original genera are *Eugenia*, *Psidium*, *Myrtus*, and *Caryophyllus* ; to which Giseke has added *Calyptranthes* and *Legnotis* of Swartz. *Melaleuca* also strictly belongs to this tribe ; though, by a strange error, referred in the *Mantissa* to the 40th order, and yet said to be akin in *Ginora*, which belongs either to this or the 17th. *Philadelphus* is subjoined as forming a section by itself, and still with a mark of doubt. The discoveries in New Holland have thrown much light on this fine order of aromatic and elegant shrubs, of which the Myrtle is a familiar type. Linnæus intended to remove *Garcinia* hither.

Order 20. *ROTACEÆ*. The lectures are also deficient as to this order. It consists of *Trientalis*, *Centunculus*,

Anagallis, *Lysimachia*, *Phlox*, *Exacum*, *Chlora*, *Gentiana*, *Swertia*, *Chironia* and *Sarothra*; to which *Ascyrum*, *Hypericum* and *Cistus* stand as an appendix. The wheel-shaped corolla of many of the above plants, has evidently suggested the name.

Order 21. PRECIÆ. *Primula* and its elegant relatives form the basis of this order. “They are all destitute of stems. Leaves simple. Flowerstalk umbellate, except in *Cyclamen*. Flower regular. Calyx, as well as corolla, five-cleft. Stamens five. Style one. Fruit a simple superior capsule. The umbel is often accompanied by an involucre. They are vernal-flowering plants, and have, except *Cyclamen*, nothing malignant in their qualities.” *Limosella* stands alone in a second section of this order, but rather perhaps belongs to the 40th. *Menyanthes*, *Hottonia* and *Samolus* form a third section, attended by a mark of doubt. *Sibthorpia* was once inserted in manuscript, but afterwards erased.

Order 22. CARYOPHYLLEI. The Pink and Campion tribe. “Root fibrous. Stem herbaceous, scarcely shrubby, jointed; its branches commonly alternate. Leaves simple, more or less of a lanceolate figure, undivided, hardly crenate in any degree, sessile, with no other appearance of a footstalk than their elongated narrow base, opposite, obvolute. Stipulas none; neither are there any distinct bractes, nor spines, prickles nor tendrils. The plants are mostly smooth, few are hairy, none prickly or bristly. Flower rarely sessile. Stamens never numerous, but either the same in number as the petals, or twice as many. Pistils from one to five, not more. Fruit a capsule, either of one cell, or of as many as there are styles; the cells usually with many seeds, *Drypis* only having a solitary seed. A few of these plants with separated flowers occur among the species of *Cucubalus*, *Silene* and *Lychnis*. The whole order is harmless, without any peculiar taste or smell, except in the flowers. It contains the *flores caryophyllati* of Tournefort, who defined these as having the

calyx tubular, and the limb of the corolla flat; but he referred *Statice* and *Linum* hither, which differ widely from this order, while his character excludes the *Alsine*, or Chickweed, tribe." Linnæus thought *Velezia* had been wrongly placed here by Gerard, and was doubtful respecting *Cherleria*; but he was afterwards satisfied that both are *Caryophyllei*. He remarks that "the order consists, as it were, of two leading genera, or rather families, the *Caryophyllus*, or Pink tribe, such as *Dianthus*, *Saponaria*, *Gypsophila*, *Silene*, *Lychnis*, &c.; and the *Alsine*, or Chickweed family, consisting of *Spergula*, *Cerastium*, *Arenaria*, *Stellaria*, and others. In the first division, the calyx is tubular, of one leaf; in the second of five." A third section of this order has *Pharnaceum*, *Glinus*, *Mollugo*, *Polycarpon*, *Minuartia*, *Queria*, *Ortega*, *Loeflingia*; to which were afterwards added *Gisekia* and *Rotala*. *Holosteum* also, having laciniated stipulaceous membranes, was intended to have been removed to this third section. *Scleranthus*, by itself, makes a fourth, but is erased by Linnæus, and removed to his 31st order. *Polypremum*, with a query, stands at the end.

A most extraordinary remark is subjoined by Professor Giseke at p. 354; that "*Alsine media* and *Holosteum umbellatum* are one and the same plant," and that "Linnæus had no specimen of the former in his herbarium in the year 1771." Swartz is cited in confirmation, who only says in his *Obs. Bot.* 118, that this *Alsine* is a species of *Holosteum*. We trust it is better referred to *Stellaria* in *Flo. Brit.*, and we can affirm that an authentic specimen of this common plant, which Linnæus had when he published the first edition of *Sp. Pl.*, in 1753, still exists in his collection. The real *Holosteum umbellatum*, a rare English plant, is well delineated in *Engl. Bot.* t. 27.

Order 23. TRIHILATÆ. "So called from its three-celled, and three-grained fruit, for all the cells are distinct. *Melia* however has five cells. The calyx in this order is

either of four or five leaves, or of one leaf in five deep segments. Petals four or five. Stamens eight or ten. Pistil one. One part of the fructification is often diminished as to number, for instance the petals; and when they become but four, the stamens are only eight. A nectary is always present; hence the corolla is frequently irregular. The leaves are disposed to be compound, and are both opposite and alternate. The whole order scarcely contains anything acrid, except *Tropæolum*, nor anything either fragrant or noxious; on the other hand, the *Tri-coccæ*, properly so called, are highly poisonous."

The first section consists of *Melia*, *Trichilia*, *Guarea* and *Turraea*; to which Linnæus has added, from his 54th or miscellaneous order, *Cedrela* and *Swietenia*. The second is composed of *Malpighia*, *Bannisteria*, *Hiræa*, *Triopteris*, *Acer*, and *Aesculus*. Linnæus was inclined to bring hither, from his 14th order, the genus *Fagonia*, because of the likeness of its flower to *Malpighia*, but he found a difficulty in the five cells of its fruit. A third section consists of *Staphylea*, *Sapindus*, *Paulinia*, *Cardiospermum* and *Tropæolum*; to which *Hippocratea* is added in manuscript, and a question subjoined, Whether *Staphylea* be not akin to *Celastrus*? Cavanilles has added many new genera to this order, but he is surely complimented to excess by the editor of the *Prælectiones*.

Order 24. CORYDALES. "The title of this order is synonymous with *Fumaria* amongst ancient writers."

"The genera are *Melanthus*, *Monniera*, *Epimedium*, *Hypecoum*, *Fumaria*, *Leontice*, *Impatiens*, *Utricularia*, *Pinguicula*, and perhaps *Calceolaria*. The calyx is of two leaves; except in *Pinguicula*, where it is only cloven; and *Melanthus*, where it consists of four leaves. The flower of *Fumaria* is remarkable in its throat, and uniform in that respect throughout the genus; but the various species differ widely in their fruit; which in some, as *officinalis*, &c. contains a solitary seed; in *capnoides*, *claviculata*, &c. it is a genuine pod; in *vesicaria* a large inflated

capsule.” *Monnieria* and *Melianthus* (two very puzzling genera,) were thought by Linnæus to be nearly related to each other, though differing from the order under consideration, in having several capsules, and a calyx in five deep divisions. But he judged the ringent corolla of *Monnieria* to betray an affinity to *Fumaria*; while the nectary of *Melianthus* is similar to that of *Monnieria*, the combined stamens of the latter being exactly those of *Fumaria*. Hence a relationship is traced between *Melianthus* and this order, which, but for *Monnieria*, could not have been suspected.

“There is a certain fragility and delicacy of texture characteristic of the *Corydales*, with a glaucous hue, which points out their affinity; as well as a bitter flavour. Scarcely any of the order are odoriferous, except *Melianthus*, which is extremely foetid.”

Linnæus professes his inability to point out any exclusive mark of distinction for this order. “The leaves indeed are alternate in all, *Calceolaria* excepted; and many bear stipulas. Their mode of flowering is spiked, racemose, or solitary, their stalk naked or leafy, different in different species. All that we are acquainted with are smooth and unarmed; a very few of them climbing by means of tendrils. *Melianthus* and *Monnieria* only are shrubby. All the tribe prefer shady, moist situations, where the soil is not disturbed.” (Some however grow in cultivated ground, as the Fumitories.)

“The *Melianthus*, a Cape plant, produces more honey than any other plant, so that a tea-spoon full may be collected every morning, from each of its numerous flowers. But the offensive odour” (of the bruised plant) “indicates a poisonous quality, as in *Cimicifuga*.”

Order 25. PUTAMINEÆ. On this order, named from the strong rind of the fruit in several instances, there is no commentary in the *Prælectiones*, nor any manuscript note in the *Gen. Pl.* The genera are *Cleome*, *Cratæva*, *Morisona*, *Capparis*; *Crescentia* and *Marcgravia* being

added with hesitation. *Tanaccium* of Swartz, and *Possira* of Aublet, which last is *Rittera* of Schreber, are subjoined by Giseke.

Order 26. MULTISILIQUÆ. This consists of four sections. In the first are *Pæonia*, *Aquilegia*, *Aconitum* and *Delphinium*, to which Linnæus, after much diversity of opinion, finally determined to add *Cimicifuga* and *Actæa*. The second contains *Dictamnus*, *Ruta* and *Peganum*: the third *Nigella*, *Garidella*, *Isopyrum*, *Trollius*, *Helleborus*, *Caltha*, *Ranunculus*, *Myosurus* and *Adonis*: and the fourth *Anemone*, *Atragene*, *Clematis*, and *Thalictrum*. “Most of the order, with a few exceptions, are of European growth; rarely arboreous or shrubby, except such species of *Clematis* as climb trees. The roots are fibrous, sometimes tuberous. Leaves often many-cleft, or compound; but in a few instances simple; all alternate, except in *Clematis integrifolia*. There are no stipulas, spines, nor prickles. One or two kinds of *Clematis* bear tendrils. Flowers in no case monopetalous. Stamens always more than eight, except in the second section. Fruit in some capsular, in some single-seeded. An acrid taste prevails through the whole. Their odour is disagreeable, almost universally, so that none is esculent, and many, if not all, are poisonous, though there is no milky plant among the whole, nor any one with a twining stem.” Linnæus remarks, that “a calyx is very rarely present, and when it occurs, manifestly originates from the leaves;” but this is not applicable to *Ranunculus* and its nearest relations, nor to any genus in the second section; that section indeed being a most distinct order of itself, called by Jussieu *Rutaceæ*, but not well defined by him.

Order 27. RHŒADEÆ. The poppy tribe. No remark on this order is found in the lectures of Linnæus, but he has made some manuscript notes. He wished to remove it next to the 24th and to place its genera thus, *Argemone*, *Chelidonium*, *Papaver*, *Podophyllum*, *Sanguinaria* and *Bocconia*. *Sanguinaria*, he observes, has the flower of

Actæa, which last genus he had once brought hither. He has finally placed here *Aristolochia*, *Asarum* and *Cytinus*, as we have mentioned under the 11th order. *Nymphæa* also is indicated, but afterwards erased, which is unfortunate.

Order 28. LURIDÆ. The gloomy family of nightshades, henbane and tobacco. "This order is a most distinct and evident one. All the plants have alternate leaves; a five-cleft calyx; monopetalous corolla; stamens four or five; pistil one; germen superior; seed-vessel of two cells, in some a berry, others a capsule. Their corolla folds in a plaited manner."

Digitalis, *Celsia*, *Verbascum*, *Nicotiana*, *Atropa*, *Hyoscyamus*, *Datura*, *Physalis*, *Solanum*, *Capsicum*, are examples of this order. "They are none of them arboreous, though some are shrubby. Colour (of the herbage) mostly dull and lurid; the taste disagreeable, smell nauseous, hurtful to the nerves, hence their generally poisonous qualities." *Ellisia* is properly expunged in the manuscript, and *Nolana* with equal propriety removed hither from the 41st order.

Linnæus observes, that "the poisonous quality of *Verbascum* appears in its power of killing fish, if made up into balls with meal." "*Nicotiana rustica*," he says, "furnishes the Turks with their best tobacco, yet it is not cultivated by us, though it grows readily. *Atropa Mandragora*, a most poisonous and dangerous plant, becomes, under proper management, an excellent and powerful medicine," for instances of which Linnæus referred his hearers to his lectures on the *Materia Medica*. These, as Giseke notices, were never published. On turning to the manuscripts used by the professor in that course, we find the *Mandragora* mentioned as "virose, acrid, bitterish and nauseous, useful in the gout and colic; the herb boiled in milk, and applied to scirrhus tumours, more active in dispersing them than hemlock or tobacco. Three of the berries boiled in milk, given to a potter, labouring under

a dreadful cholic, threw him into a sleep for twenty-four hours, out of which he awoke cured. The ancients gave an infusion of this plant in wine, before they amputated a limb. Its narcotic qualities render it very useful in epilepsy and hysteria, though to be cautiously administered. Nothing can be more dangerous in a state of pregnancy. The editor of Hernandez, *Hist. Nat. Mexic.* Book viii. chapter 28, speaks of this fruit as eatable, without any soporific or injurious effect."

Linnæus himself appears to have been doubtful about *Catesbæa*, which he has marked as akin to his *Dumosæ*. Giseke has subjoined an observation, not well founded, of the *Solandra* of Swartz being hardly distinct from *Datura*.

Order 29. CAMPANACEÆ. These Linnæus has noted as most nearly allied to the 24th order. "They never form trees, rarely shrubs. Leaves in every instance alternate; calyx and corolla five-cleft; stamens five; pistil one, except *Evolvulus*, which has at least a deeply four-cleft style, if not four distinct ones. Fruit a capsule. They are milky plants, at least while young and tender. Their qualities therefore are purgative, and but slightly poisonous."

Convolvulus and *Campanula*, with their respective allies, constitute this order. To the latter *Viola* is supposed to be connected, through the medium of *Lobelia*. *Parnassia*, though in the manuscript rightly said to be not milky, stands at the end, its affinity being indicated by the nature of the flower-stalk, calyx, as well as the seeds and their situation, but especially the nectaries and stigma. The anthers come one after another and impregnate the latter, retiring subsequently in their turns. Their close application to that part, as Linnæus conceived, rendered the access of extraneous pollen impossible, "hence," says he, "no more species of this genus can be produced." This alludes to his hypothesis of new and permanent species, or even genera, having been generated, from time to

time, in the vegetable kingdom, by cross impregnation; which we are very unwilling to admit, nor do any of his instances prove satisfactory to us. As to *Parnassia*, we now know several American species, as distinct as those of any other genus.

Order 30. CONTORTÆ. "This order derives its name from the corolla, which," (in all the species known to Linnæus,) "is twisted in the bud, contrary to the course of the sun, its limb being wheel-shaped, when expanded, in such a way that each of its segments, unequally proportioned in their margins, is curved inward under the next segment, the shorter side of the former being beneath the longer one of the latter. Europe is very poor in this tribe, India very abundant. Many of the plants are milky, and, like most other such, poisonous; some indeed so violently, as immediately to destroy animals that eat them. Their medical effects, rightly managed, may be very great. They have all, naturally, an injurious property, even *Asclepias Vincetoxicum*, though this plant, like *Nerium* and *Vinca*, is scarcely milky, but in its very youngest shoots." (It is singularly remarkable that the fruit of one of this family, at Sierra Leone, the size of an orange, yields a copious and wholesome milk, used by the colonists as cream to their tea. See *Sm. Introd. to Botany*, ed. 3. 316.)

"Many of the order of which we are treating are shrubby; the leaves opposite and evergreen, except the species of cold countries. The flower is, in many cases, intricate in structure, because of the peculiar apparatus of the nectaries of various genera."

"The roots are perennial. Leaves all, as far as hitherto known, simple and undivided, and, with very few exceptions, opposite; sometimes ternate, or quaternate; rarely alternate. The inflorescence is often peculiar, in having its flowerstalk not axillary, but proceeding from the side of the stem between the insertion of the leaves. Calyx of one leaf, five-cleft. Corolla of one petal, regular,

its segments contorted, as above described, and often notched in the margin. Nectaries, in many instances, singularly formed. Stamens five. Pistils two, or one with a double stigma. Germen superior in all, except *Gardenia*, *Genipa*, and *Macrocnemum*," (all now certainly not admitted into this order.) "The Fruit, in many genera, as *Vinca*, *Nerium*, *Echites*, *Plumeria*, *Tabernæmontana*, *Cameraria*, *Periploca*, *Apocynum*, *Cynanchum*, *Asclepias*, *Stapelia*, *Ceropegia* and *Pergularia*, consists of two distinct follicles, not observable in other plants. This sort of seed-vessel is like a *spatha* amongst the other kinds of calyx, of one valve, splitting longitudinally at the inner edge. But the seeds are not attached to the suture, there being a separate thread-shaped receptacle, extending the whole length of the seed-vessel, over the whole of which the seeds are imbricated, in a downward position. In all the above mentioned the seeds are crowned with a soft hairy tuft, except those of *Vinca*, which have no such appendage. The flowers of the *Contortæ* are usually very handsome, and there is something so singular in the structure of many of them, especially relative to the nectary and stigma, that it is difficult to say, in many instances, whether they have one or two stigmas; especially when two germens seem to bear but a single style. The corolla in all is five-cleft, and the stamens five. Jacquin contends that the latter are really ten. Linnæus from repeated examination of *Asclepias*, was confirmed in the former opinion, and especially from the investigation of *Periploca*, whose flower, evidently constructed on the same principle as *Asclepias*, has, no less evidently, but five stamens."

Giseke very improperly annexes *Embothrium* and *Rhopala* to this order, only because their fruit is a follicle; nor does any other genus which he, or Linnæus, has mentioned, really belong to it, except *Allamanda*, *Rauwolfia* and *Cerbera* of the latter; *Gynopogon* and *Melodinus* of Forster, with *Willughbeia* of Schreber. The first has a bivalve coriaceous capsule, as if formed of two follicles

united, with imbricated seeds; the rest have pulpy fruits. Most of the other genera referred hither, as *Gardenia*, *Cinchona*, *Portlandia*, &c. belong to the great order of *Rubiaceæ* in Jussieu, of which the Linnæan *Stellatæ*, No. 47, make a part. It must be allowed, nevertheless, that the corolla of *Gardenia* answers to the character of the *Contortæ*. Mr. R. Brown, in the *Wernerian Transactions*, has thrown much light on the principal genera of this family, under the title of *Asclepiadeæ* and *Apocineæ*, with the addition of numerous new ones.

Order 31. *VEPRECULÆ*. No explanation of this occurs in the *Prælectiones*. The genera are *Dais*, *Quisqualis*, *Dirca*, *Daphne*, *Gnidia*, *Struthiola*, *Lachnæa*, *Passerina*, *Stellera*, with *Thesium*, and in the manuscript *Scleranthus* and *Santalum*. These three last do not properly belong to the others, which constitute a most natural order of generally small shrubs, as the name implies. They are known by their tough branches; silky inner bark; simple entire leaves; acrid and even burning flavour; and sweet-scented flowers, whose calyx and corolla are united into one integument, most coloured within.

Order 32. *PAPILIONACEÆ*. An extensive and very natural family, “consisting of the *Leguminosæ* of Ray; which Tournefort,” (following an idea of Baptista Porta), “called *Papilionaceæ*; Rivinus *flores tetrapetali irregulares*; and Magnol *pentapetali*. They have not all five petals, for in many the claw of their keel is simple; in some the keel is separated towards the base into a double claw; while in a few only, the whole keel is composed of two distinct petals, as in *Spartium*.”

“Their character is as follows. Perianth of one leaf, irregular, inferior, generally withering. Corolla nearly the same in all. Its standard either emarginate or entire, either reflexed or not at the sides, for the most part very large, compared with the other petals. Wings, if present, always two, opposite, frequently large, sometimes, as in *Colutea* and *Hedysarum*, very short. Keel simple, either

pointed, obtuse, or abrupt. Stamens ten, nine of which have their filaments united, more than half way up, forming a membranous sheath to the pistil; the tenth sticking closely under the pistil, and being sometimes inserted into the base of the tube composed by the other nine. Hence arise two divisions of the order, without attention to which the genera are with difficulty defined. Pistil generally uniform; the style downy or woolly, either above or below; stigma either acute or capitate. Legume of two valves, which must not be confounded with a *Siliqua*, or Pod, though old writers have so termed it, applying that name equally to the fruit of this order and that of the *Tetradynamia* class. As these fruits differ widely in structure, Linnæus has restricted to the latter the term pod, whose character is to have the seeds attached to each suture of the valves; whereas in the legume, or fruit of the class *Diadelphia*, they are connected with one suture, or margin, only. The name of *legumen* indeed originally belonged to the seed itself of these plants; but for want of a better word, Linnæus has applied it to their seed-vessel. The legume is mostly of one cell, containing many seeds; except *Astragalus* and *Biserrula*, in which one suture is internally dilated, as it were, so as to make a partition, separating the fruit into two cells; whilst *Phaca* has the same part extended only half the breadth of the legume, rendering the separation incomplete. *Geoffræa* has a *drupa*, which still ought to be considered as a single-seeded legume, whose pulp is hardened," (or rather, whose coat is made pulpy.) "The ripe legume bursts along its sutures, and throws out its seeds. There are indeed some which do not open in this manner, but fall off in separate joints, each containing a seed, examples of which are *Hedysarum* and *Ornithopus*."

"The genera of this natural order so nearly approach each other, that it is difficult to detect their discriminative characters. Tournefort, though he distributed other genera by their flowers, divided and determined these by

their foliage. But *Hedysarum* forms an objection to such a principle of arrangement, because some of its species have simple leaves, others ternate, conjugate, or pinnate."

"*Lathyrus*, *Cicer*, and *Vicia* are genera most nearly akin to each other, as are *Phaseolus* and *Dolichos*. *Coronilla*, *Ornithopus*, *Hippocrepis*, *Scorpiurus*, *Lotus*, and some species of *Trifolium*, agree in their umbellate inflorescence." (*Sophora*, and its many new-discovered allies, ought to make a section, at least, by themselves.)

"There is no poisonous plant in this whole order, except the seeds of *Lupinus*, with which the *Hippopotamus* is killed, and which fowls will not eat. Indigo becomes poisonous in its preparation, but the plant is originally harmless. On the other hand, none of this tribe is medicinal, except *Glycyrrhiza*. *Galega*, commended as antipestilential, is not to be trusted. These plants have no remarkable odour," (except in the flowers of a few species.) "Their seeds are flatulent; but afford nourishing food for labouring people."

Order 33. LOMENTACEÆ. "These are perhaps all shrubby," (or arboreous.) "Leaves alternate, compound, at least in the indubitable plants of this order; pinnate or bipinnate; without a terminal leaflet, *Moringa* excepted. Stipulas always large, particularly to be noticed. Calyx five-cleft. Corolla in some degree irregular, polypetalous, except *Ceratonia*, and several *Mimosæ*. Stamens differing in number; mostly ten. Pistil universally single. Fruit a legume, for the most part having transverse partitions. The leaves fold together at night, except those of *Ceratonia*, and that in a different manner according to the different species. Many of this order possess a purgative quality, while some have a virose or nauseous flavour about them, but this last is not at all the case with *Ceratonia*."

Of *Polygala*, which stands at the head of this order, nothing is recorded by Giseke from the lectures of Linnæus, nor has he himself made any note. It surely answers but indifferently to the *Lomentaceæ*. Genuine ex-

amples of the order are *Bauhinia*, *Hymenæa*, *Casalpinia*, *Cassia*, perhaps *Securidaca*; from which *Ceratonia*, *Mimosa*, *Gleditsia*, &c. considerably recede in character, though less in habit. *Cercis* ought to be ranged with *Anagyris*, *Sophora*, &c. either in the preceding order, or rather in a separate one, intermediate between the two.

Order 34. CUCURBITACEÆ. “ In this order there are, properly, no trees. Some of the plants indeed have a climbing, woody, perennial stem; others a perennial root only; whilst others again are entirely of annual duration. Leaves in all alternate, simple, always accompanied at their origin by stipulas. There are mostly glands, either on the footstalks, at the base of the leaf, or on its disk. All have tendrils, by which they climb if they have any opportunity; otherwise they are procumbent. These plants seem akin to the *Sarmentaceæ*, order 11th; but the latter have a twining stem, these not; they are monocotyledonous, these dicotyledonous; they are destitute of tendrils, with which these are furnished. The calyx is either of five leaves, or five deep segments. Corolla of one petal, in five deep divisions, but so much cut in many instances, that it is scarcely possible, but from analogy, to say whether it consists of one or five petals. The stamens are inserted, not into the receptacle, but into the interior surface of the calyx, to which also the corolla is attached. Their filaments are often five, but frequently so combined as to appear three only. So also the anthers are often connected, the summit of one to the base of another, making a continued serpentine line. The style is of considerable thickness, with three, frequently cloven, stigmas. Fruit internally of three cells, fleshy, and somewhat juicy. The seeds are, for the most part, capable of being kept for a long time, though they appear of a dry nature; but that they are not really so, is evident from the emulsions prepared from some seeds of this tribe. Gardeners think them better for keeping. The sex of the flowers is, in several cases, distinct, and either monoecious or dioecious.

The whole order is noxious and foetid, hence it affords some of the most violent medicines, as *Colocynth* and *Elaterium*. Even melons themselves, if taken too plentifully, are said to be injurious, though in ripening they part with much of their unwholesome quality." The genera are *Gronovia*, *Anguria*, *Elaterium*, *Sicyos*, *Melothria*, *Bryonia*, *Cucurbita*, *Cucumis*, *Trichosanthes*, *Momordica*, *Feuillea*, *Zannonia*, *Passiflora*. "The last affords some of the most beautiful of all flowers; many of them are fragrant."

Order 35. SENTICOSÆ. The briar and bramble tribe. The genera are *Alchemilla*, *Aphanes*, *Agrimonia*, *Dryas*, *Geum*, *Sibbaldia*, *Tormentilla*, *Potentilla*, *Comarum*, *Fragaria*, *Rubus*, *Rosa*. *Poterium* and *Sanguisorba* are inserted at the head of this list, in the Linnæan manuscript. See the following order.

Order 36. POMACEÆ. The apple and plum kinds, consisting, in the first section, of *Spiræa*, *Ribes*, *Sorbus*, *Cratægus*, *Mespilus*, *Pyrus*; in a second, of *Punica*; and, in a third, of *Chrysobalanus*, *Prunus* and *Amygdalus*. These two orders are treated of together, in the *Prælectiones*, it is not said for what reason, though their strict affinity cannot be overlooked. "Many of these plants," says Linnæus, "are shrubs, most of the whole are perennial, very few annual. They are rarely smooth. The leaves are alternate, mostly compound. Stipulas always two, large. None of the plants properly climb, though some brambles support themselves on their neighbours. Their distinguishing character principally consists in the receptacle of the stamens being equally that of the germen, but raised, at the sides of the calyx, above the germen. Hence, the calyx bearing the stamens, they are *calycanthemi*. The fruit is either superior or inferior, therefore that distinction is not always important. In *Rosa*, for instance, the part in question seems inferior, but is in fact the contrary, for the seeds are really inserted into the inner side of the calyx, exactly as in *Mespilus*, with this

difference only, that in the latter they are imbedded in the pulp, which fills the calyx. The segments of the calyx are mostly in a double series, the innermost largest, the outer alternate therewith, and smaller, answering to the petals. Stamens for the most part numerous, but *Sibbaldia*, *Alchemilla*, and *Aphanes* form an exception, the first having five stamens, the two last only four," (or even fewer). "The pistils vary in number. There is nothing acrid in the whole order, nor much fragrance; there is much of a styptic, little of a mucilaginous quality; nothing poisonous; so that if the fruits are worth tasting, they may certainly be eaten with impunity."

Order 37. COLUMNIFERÆ. "So called, not because the author meant to express, in the name, the essential character, but in allusion to some distinguished examples of this order, whose stamens are united into a columnar form. Linnæus was really the founder of the order in question, though Tournefort endeavoured to keep together as many of the same plants as possible, under his *Monopetali Campaniformes*. But the corolla has five petals, though they all fall off in one body, being connected with the combined stamens. Some have been denominated *akin to Malvaceæ*; indeed many of the class *Monadelphica* belong to this tribe."

"The root in all these plants is fibrous, in no instance bulbous or tuberous. Stem often herbaceous, but there are many arboreous, and amongst others the kinds of *Bombax*, or Silk Cotton, almost the largest trees in the world. Some of these only bear spines; but some species of *Hibiscus* are prickly. There is scarcely a perfectly smooth plant in the whole order. They have all stipulas, in pairs. The leaves are alternate, never opposite; in numerous instances stalked; plaited in the bud; and, what is remarkable, many of them have glandular pores under the rib. No tendrils are found in the order. The inflorescence is various. Calyx in several simple and five-cleft, but in some genera double, as *Malva*, *Alcea*, *Al-*

thæa, *Lavatera*, *Malope*, *Gossypium* and *Hibiscus*. Petals generally five, but as they often adhere to the united filaments, the corolla seems monopetalous. This adhesion contradicts the opinion of Vaillant, who has said that stamens are never inserted but into a monopetalous corolla. Their connected claws often form a nectary between them. The corolla is somewhat abrupt, and twisted contrary to the sun's motion. Pistils usually corresponding in number to the parts of the fruit; as do the stigmas, where the style is simple. *Turnera* has as many styles as there are cells in the capsule. The fruit is always superior, but differs in different genera. *Malva*, *Alcea*, *Althæa*, *Lavatera* and *Malope*, have numerous capsules, ranged like a wheel round the base of the style; nor is the latter placed upon, but in the midst of, them, as in the *Asperifoliæ*, order 41. Each capsule is single-seeded, and falls off with the seed; which is likewise the case in *Urena*; such seed-vessels might perhaps rather be named *arilli*, or tunics, as they burst at their inner side. Many of this order have solitary seeds in their cells, or capsules, like the above, and the genus *Ayenia*; but many others are polyspermous, as *Bombax*, *Hibiscus*, *Theobroma*, &c. A few of the genera produce woolly seeds, as *Bombax* and *Gossypium*; in the place of which appendage, *Adansonia* has a mealy powder. Some bear a capsule of five cells, containing many seeds; which in *Hibiscus Malvaviscus*," (now constituting the genus *Achania*,) "becomes pulpy. It is curious that *Hibiscus Moscheutos* bears its flower-stalk upon the footstalk, like *Turnera*; a rare circumstance in the whole vegetable kingdom."

"*Hermannia* has hooded petals, in a corolla twisted like that of *Malva*. They are auricled and dilated below, forming a nectary by their involution, as the true *Malvaceæ* do by the cohesion, or approximation, of their petals. The calyx is tumid. Capsule of five cells. All the species are shrubby. The flowers are so alike in all, as hardly to be distinguishable from one another; and hence per-

haps it may be presumed, that the various species, all natives of the Cape of Good Hope, may in this, as well as other genera, have been produced from the hybrid impregnation of some original one. *H. pinnata* has the only compound leaves in this order." We must protest against this extensive speculation, of the production of permanent mule species, having seen many arise from such a cause, but none continue to propagate itself for any length of time. It is not the least curious particular, in the structure of the genus before us, that the flowers, which commonly grow together in pairs, have the corolla twisted in an opposite direction to each other.

The second section of this order, composed of *Camellia*, *Thea*, *Gordonia*, *Stuartia*, *Tilia* and *Kiggelaria*, are at least nearly akin to the foregoing genera.

"This whole order contains no disagreeable or hurtful plants, nor are they esculent. None are fœtid, but some agreeably fragrant. Many of the flowers are beautiful. Their quality is generally mucilaginous, particularly *Althæa*, *Malva* and *Alcea*. The ancients made considerable use of Mallows in their food, but these plants are now out of use in that respect."

Order 38. TRICOCCÆ. "Botanists apply this term to plants whose fruit is, in a manner, composed of three nuts, combined together like that of *Thea*. In the order under consideration, the seed-vessel is generally a roundish three-cornered capsule, rounded on all sides, with single-seeded cells, which bursting elastically, with considerable force, scatter the seeds to a distance. It must be observed, however, that as in this order some genera, like *Mercurialis* and *Cliffortia*, are dicoccous" (having only two cells, or lobes), "so there are tricoccous plants" (as *Thea*, and many more,) "that do not belong to it."

"The plants of this order bear alternate, mostly simple, leaves, often furnished with glands. Many afford a most acrid milk; they are generally offensive, nauseous, purgative, or poisonous. The style is in several highly

remarkable, being more or less deeply three-cleft, and each of its branches divided. The calyx, as well as corolla, have always something unusual in their conformation, or in their nectary; and many of the genera are monoecious or dioecious."

"*Euphorbia*, as a familiar and most distinct genus, may serve as a principal example. It is certainly no less singular than extensive. The calyx of one inflated leaf has four or five marginal teeth, and terminates in as many abrupt coloured glands. The latter are remarkably situated on the teeth themselves; but these teeth seem, together with their glands, to be rudiments of petals. In *Euphorbia corollata* the glands are actual petals, as thin, expanded, and delicate, as those of Flax; but scarcely another instance is known, of petals originating in teeth of a calyx."

"*Plukenetia*, a very rare plant, has a four-cleft flower, and four-celled fruit, with a climbing stem."

There are numerous genera besides. *Rumphia* and *Trewia* are added to the list in the Linnæan manuscript.

Order 39. SILIQUOSÆ. "All botanists have acknowledged the common affinity of the genera constituting this order, and have denominated them *Siliquosæ* and *Siliculosæ*. Tournefort called them cruciform flowers; Linnæus, *Tetradynamia*. These plants have mostly inversely-heartshaped cotyledons, except some Cresses, in which those organs are three-cleft; the rest agree with the genus *Convolvulus*; so this character is no proof of affinity."

"The stems are herbaceous, except some species of *Alyssum*, and one *Vella*. There is no real tree among the whole. The roots are all fibrous, none bulbous or tuberous," (except perhaps *Dentaria*.) "Leaves universally alternate, without stipulas, tendrils, prickles, or venomous stings. Inflorescence usually a *corymbus*, which gradually elongates itself into a *racemus*, so that the flowers are corymbose, and fruit racemose. Calyx always of four

leaves, deciduous, except in *Alyssum calycinum* and *Brassica Erucastrum*. Petals four, with claws ; some species of *Lepidium* and *Cardamine* only having flat, or straight petals. The receptacle in most, but not in all, is furnished with glands. Stamens six, the two opposite ones shorter, or at least more spreading.” (A very few species have only four or two stamens.) “Fruit commonly a pod, with two valves, two cells, and many seeds. A few genera have a solitary seed, either imbedded in pulp, as *Crambe* ; or in a lamellated flat seed-vessel, as *Isatis* ; or in an angular one, as *Bunias*.”

“The plants of this order are distinguishable into *Siliquosæ* and *Siliculosæ*, the former having an oblong, the latter a rounded pod. But it being difficult to define the precise limits of each, Linnæus refers to the *Siliquosæ* such as have a stigma without a style, and to the *Siliculosæ* such as have a style to elevate the stigma, which character is conspicuous in every instance, except in *Draba*, where the style is but short.”

“It is of importance to observe whether the calyx in the present order be closed or spreading ; that is, whether the leaves composing that part be parallel, so that their sides touch each other, or horizontally distant.”

“The nature of a *Siliqua*, or Pod, appears from what has been already mentioned. It differs from a Legume, in having the seeds attached to each suture, or margin.”

“All these plants have a more or less acrid watery juice ; hence their external application excites redness in the skin, and their internal use irritates the finer fibres. Nature therefore is solicitous to expel them, and, in consequence of their watery nature, by the kidneys, hence they are all diuretic. Salt, being of a corrosive quality, produces scurvy ; but salt is secreted from the body by the promotion of urine, though it must first be dissolved in a watery menstruum ; consequently the herbs in question rank among the chief antiscorbutics, especially water-cresses and scurvy-grass. They ought never to be used

in a dried state, as their acrimony and medical virtues are destroyed by drying. Boiling likewise is destructive of acrimony, especially in these plants; they ought therefore to be taken recent. Their diuretic powers render them eminently serviceable for evacuating water in the dropsy. Yet their use ought not to be too long continued, as their acrimony abrades the minuter fibres, rendering the vessels, and the intestines, in a manner, callous. This appears from the rigidity and torpidity of stomach induced by too much use of mustard."

"There is scarcely any thing odoriferous about these plants, except in their flowers. When they are bruised, indeed, something volatile ascends, of an acrid, rather than odorous nature, irritating the coats of the nerves, and inducing spasms, which do not originate in the medullary substance of the nervous system, but in its coats."

No alteration or addition respecting the genera of the *Tetradynamia* occurs in the Linnæan manuscript.

Order 40. PERSONATÆ. There is no commentary on this order in the lectures of Linnæus. Giseke has given a synoptical arrangement of the genera, according to the shape of the corolla, which is not in every part precisely correct. He justly expresses his doubts respecting *Melaleuca*, of which we have spoken under the 19th order; and he truly observes that there is no order in which so many genera are named after botanists as in the present.

The only manuscript additions or corrections, which occur in the *Genera Plantarum* of Linnæus, are the following: *Martynia*, *Craniolaria*, *Torenia* and *Scrophularia* are pointed out as akin to *Pedanium*, in order 28th; *Hyobanche*, *Lindernia*, *Paderota*, *Manulea*, *Premna* and *Calceolaria* are inserted, with a question, certainly not well founded, whether the latter should not rather be referred to the 24th order. *Brunfelsia* also is placed among the *Personatæ*, at the suggestion of Van Royen.

Order 41. ASPERIFOLIÆ. "These plants were first

collected into an order by Cæsalpinus, and received the above appellation from Ray, because of their generally harsh or rough habit. Their root is fibrous. Cotyledons two. Stem branched ; the branches alternate and round. Leaves alternate, simple ; neither divided nor compound, for the most part nearly entire, rough with rigid scattered hairs ; convolute before they expand. Stipulas none ; nor are there, except very rarely, any other *fulcra*, or appendages. Common flowerstalk having the flowers ranged along one side. Before flowering it is rolled spirally backwards, gradually expanding as the flowers are ready to open, and divided into two parts, each bearing the flowers on its back, in the form of an unilateral spike. Calyx in five divisions. Corolla inferior, of one petal, regular except in *Echium*, five-cleft ; its mouth either furnished with vaulted valves, or crowned with teeth, or naked. Stamens five, equal ; in *Echium* only they are unequal. Fruit superior. Germens four, naked, except in *Cynoglossum*, *Tournefortia*, and *Nolana* ; inserted in the receptacle by their base ; hence the lowest part of each seed is of a tapering form, as if artificially rounded. Pistil one. Style not standing upon the germens, but occupying the central space between them ; often divided into two equal parts ; not one longer than the other as in the class *Didynamia*. Seeds four, rarely combined into two ; but it is singular that *Nolana* has five seeds." Linnaeus has, as already mentioned, removed this genus to his *Luridæ*, order 28th.

"The *Asperifoliæ* are distributed according to the mouth, or throat, of their corolla, which is naked, or pervious, in *Echium*, *Pulmonaria*, *Lithospermum*, *Heliotropium*, *Cerithe*, and *Onosma* ; toothed in *Symphytum* and *Borago* ; closed with vaulted valves in *Cynoglossum*, *Asperugo*, *Anchusa*, *Lycopsis*, *Myosotis*, and *Tournefortia*."

In the *Gen. Plant.* *Messerschmidia*, *Coldenia*, *Hydrophyllum*, and *Ellisia* are inserted in manuscript.

“All the *Asperifoliæ* are mucilaginous, and act only as such. The ancients selected their four cordial flowers out of this order, seeming not to have been aware that the motion of the heart depends upon the nerves, which therefore must be strengthened if the force of the heart is to be increased. This end however is not to be attained by either the flowers or the herbs of this tribe, which nevertheless have long been used for the purpose. The leaves may be eaten as food, by which their small medical use may be estimated. The root is perennial and mucilaginous ;” (we would rather say, “if perennial, is mucilaginous,” which perhaps were the original words of the lecture.) “Among the whole, *Symphytum* abounds most with mucilage, equalling, in quantity as well as quality, the monadelphous plant *Althæa* in this respect. *Symphytum tuberosum* has been recommended in the gout. Possibly its mucilaginous quality may hinder the crystallization of the gouty matter. The root in almost all the *Asperifoliæ* is red, but for the most part externally only. The root of *Lithospermum tinctorium*, now *Anchusa tinctoria*, is used for its colouring properties. Of all plants, the herbs of this order yield the largest proportion of ashes. There is hardly an odoriferous, nor one fragrant, herb in the whole tribe ; though *Cynoglossum* has a somewhat foetid scent. Their taste is nothing, the great quantity of mucilage involving the stimulating particles. These herbs are esculent, especially when young and tender, although their rough surface renders them less agreeable to delicate palates. They generally grow in dry mountainous situations ; and it is singular that in proportion as they are found nearer to water, they become smoother.”

Order 42. VERTICILLATÆ. “Ray, in constructing his system, founded three classes, which all succeeding botanists hitherto have approved, the *Stellatæ*, *Asperifoliæ*, and *Verticillatæ* ; but he was unable to give proper characters of the genera. Hermann subsequently, esta-

blishing a system upon the fruit, called the *Verticillatæ* of Ray *Gymnotetraspermæ*, plants with four naked seeds, but he could not by this means distinguish them from the *Asperifoliæ*, which have the same character. The generality of *Asperifoliæ*, in fact, differ from the *Gymnotetraspermæ*, in their corolla, which in the former is regular, in the latter irregular, though likewise monopetalous. But *Echium*, though it belongs to the *Asperifoliæ*, has still an irregular corolla. The *Asperifoliæ* have alternate leaves, the *Gymnotetraspermæ* opposite ones. These classes might therefore be distinguished from each other, according to Hermann's method, were not *Echium* an obstacle. Linnæus, however, that he might avoid all confusion between the orders in question, has borrowed a character from the stamens, and has referred to his class *Didynamia* such plants as have two stamens longer, and two shorter. He has moreover divided that class into two orders, the first of which comprehends Hermann's *Gymnotetraspermæ*, whose stamens easily distinguish them from the *Asperifoliæ*. But the consideration of the stamens has further obliged the author of the sexual system to refer certain genera, of the natural order under our present consideration, to his class *Diandria*. These are *Verbena*, *Lycopus*, *Amethystea*, *Ziziphora*, *Cunila*, *Monarda*, *Rosmarinus*, *Salvia*, and *Collinsonia*; of which *Verbena* and *Collinsonia* perhaps ought rather to be placed in the other order of the *Didynamia*, called *Angiospermia*." This is correct with regard to *Verbena* only.

"The calyx of the *Verticillatæ* is of one leaf, inferior. Corolla of one petal, irregular, in most instances gaping, with two lips, the uppermost of which was called by Rivinus the *galea*, or helmet, the lowermost the *barba*, or beard. Stamens four, except in the several genera just mentioned, where they are only two, inflexed, ascending under the upper lip. Germens four, from between which the style arises, as in the *Asperifoliæ*, which is wavy, so-

litary, except in *Perilla*, where there are two, and bearing two acute stigmas. Seeds four, naked, *Prasium* excepted, whose seeds have a succulent skin, causing them to resemble berries. A berry, properly speaking, is a seed-vessel; but in *Rosa* it is the calyx, in *Fragaria* the receptacle, and in *Prasium* the skin of the seeds."

"Many of this order are humble shrubs, none are trees, most of them are annual or perennial herbs. The stem is generally square. Leaves in every instance opposite, simple, mostly undivided. None of the plants are furnished with tendrils, nor of a climbing nature. The scent of nearly all of them is highly fragrant, the odoriferous matter being contained in minute cells, which, when the leaves are held against the light, appear like numerous perforations."

"The flowers usually stand in whorls, encircling the stem as with a ring. When these whorls approach very closely together, the stems appear spiked, as in *Origanum*."

"This order is in the highest degree natural; whence arises great difficulty in determining the genera. Linnæus has derived a character from the calyx, according to which the whole order is divided into two sections."

"The first of these comprehends such as have a five-cleft calyx, that is, where all the teeth of this part are nearly of equal size and shape. The second consists of those with a two-lipped calyx, which is indeed five-cleft, but its two upper segments are, in a manner, united into one, which might almost be termed emarginate only; while between these two united segments and the remaining three, there is so deep a fissure, at each side, that the calyx is nearly divided into two parts, or lobes. Linnæus has bestowed great attention in searching for the essential characters of genera in this natural order, and has detected several, which are marked in the *Systema Vegetabilium* with a sign of exclamation."

Order 43. DUMOSÆ. “*Dumus* and *nemus* are synonymous, meaning a thicket ; or wood consisting of shrubs, not of large trees. All the plants of this order are shrubby, but none of them, except in the genera of *Sideroxylum* and *Chrysophyllum*, grow to large trees.”

“*Rhamnus* is supposed to be familiar to everybody. Its calyx is tubular, five-cleft at the margin, occasionally coloured, like a corolla, but not perforated at the bottom. A monopetalous corolla falls off, with a perforated tube ; which is not the case here. But betwixt every two segments of the calyx is stationed a delicate little scale, which any person might easily take for so many petals. The stamens however, being placed under each scale, are therefore alternate with the divisions of the calyx ; whereas if these scales were real petals, the stamens ought, by a general rule, to be alternate with them, and not with the parts into which the calyx is divided. Some species, as the Buckthorn, *R. catharticus*, have four-cleft flowers, but they are mostly five-cleft. This last-mentioned, like *R. alpinus*, is dioecious ; *Zizyphus* is polygamous. The stigma in some *Rhamni* is emarginate, in others three- or four-cleft. The fruit of this genus is various ; a berry in some with four seeds, in others, as *Paliurus* and *Alaternus*, with three ; in others again it has a single seed with two cells, as in *Zizyphus*. *Paliurus* has not, properly, a berry, but a depressed, bordered, shield-like capsule. The stem in some is thorny, in others prickly, in others unarmed.”

“French botanists have recommended the dividing of this genus into several, a measure which appears highly proper to those who have not seen the Indian species. If such genera are to be distinguished by their fruit, species most resembling each other will be put asunder, and widely different ones brought together, as any person making the experiment will find. Besides, the structure of the flower, and the habit of the plants, are respectively so alike in all the species in question, and so different from all the

rest of the order, that any peasant might perceive their affinity."

"*Phylica* agrees in almost every point with *Rhamnus*, except that its flowers are aggregate, and florets superior. This genus is so nearly akin to *Brunia*, that without seeing the fruit, which very rarely occurs, they can scarcely be distinguished. *Phylica radiata* therefore, universally esteemed a *Phylica*, proves, on the detection of its fruit, to be a *Brunia*."

"*Ceanothus*, with its three-lobed fruit, like that of *Rhamnus Alaternus*, agrees in every character with *Rhamnus*; but the scales of that genus are here drawn out into vaulted petals, supported by long claws."

"*Büttneria* differs in hardly any respect from *Rhamnus*, except its anthers; for the calyx, prickles, and every thing else, answer so well, that at first sight one would decidedly take it for a species thereof."

"*Sideroxylum* has a five-cleft calyx, and at the same time a monopetalous corolla; but between all the segments of the latter stands a little serrated tooth, analogous to the scales of *Rhamnus*. The flowers are likewise sessile on the stem, but the berry has only one seed."

"*Chrysophyllum* is so nearly akin, and so similar, to *Sideroxylum*, as hardly to be distinguishable by its general aspect; but its fruit contains many seeds, though indeed they are disposed in a circle."

"*Achras* differs from *Chrysophyllum* in having a six-cleft flower; and to this genus *Prinos* is very nearly related, differing in the flat form of the corolla, and fewer cells of the fruit."

"*Ilex* so nearly accords with the last-mentioned genus, that the only *Prinos* then known was originally taken for an *Ilex*; but the flower of *Ilex* is four-cleft, not six-cleft."

"*Tomex* and *Callicarpa* only differ from *Ilex* in having a single style, and not four stigmas. The berry of *Callicarpa* is like that of *Ilex*. In *Tomex* the stamens are in-

serted into the receptacle, whereas in *Callicarpa* they are attached to the tube of the monopetalous corolla." These genera have since been united by the author himself.

"*Euonymus* is so nearly allied to *Tomex*, as scarcely to be distinguishable, except by having a capsule instead of a berry. Its seeds moreover have a pulpy tunic."

"*Celastrus*, though differing from *Euonymus* in having alternate leaves, is so much akin to that genus, as to have been called *Euonymus* by all systematic writers. Yet its fruit differs in number and proportion from *Euonymus*, just as *Peganum* does from *Ruta*. The tunic of the seeds however, though not pulpy, confirms the affinity to which we allude. Some botanists, especially the French, are unwilling to admit plants with opposite leaves and alternate ones into the same natural order, and they are right; yet this character is not absolute, for such a difference often occurs in one and the same genus."

"*Viburnum* and *Cassine* come so near together, that there is rather a question respecting the distinction of the genera themselves, than of their natural order. *Cassine* has three seeds, *Viburnum* one, which seems two combined. The former is akin to *Sambucus*, and, like that genus, emetic in quality. Concerning the affinity of *Viburnum* to *Ilex* and *Callicarpa*, any person, who considers their fructification and habit, can have no doubt. Thus far therefore the matter is clear."

"*Sambucus* may excite some mistrust, because of its inferior fruit; yet this is the case in *Phyllica*, about which nobody has ever doubted. The leaves, aspect, and stipulas indeed seem to indicate something extraneous, and leave us in uncertainty."

"So *Rhus* has much the same sort of fructification, and a berry with one seed; as well as the closest affinity to *Sambucus*, insomuch that if *Sambucus* be kept in this order, *Rhus* must accompany it. So also must the sister shrubs *Schinus* and *Fagara*."

"The *Dumosæ* all agree in malignant qualities. They

are either purgative, or altogether poisonous, as *Sideroxylum* is known to be at the Cape. Nor are the species of *Sambucus* clear of this charge, for their qualities are either nauseous or fœtid, and therefore sudorific, especially the berries and flowers. The bark, taken internally, is either emetic, or powerfully purgative, as its vinous infusion proves in the dropsy; externally it is a powerful repellent."

"*Rhus* is the most venomous of trees, particularly its American three-leaved species, called *Toxicodendra*, or Poison-trees. Their fumes in burning are said to have proved mortal, and their effluvia to have blinded an artist who was at work upon some of the wood. Those who, being in a perspiration, hold a branch of one of these shrubs in the hand, are seized with an eruption over the whole body."

"The bark of *Rhamnus Frangula* is our best indigenous purge, and a syrup of *Rhamnus catharticus* is safely used for children."

"In this tribe, therefore, some have opposite, others alternate, leaves, nor is any general character to be derived from the parts of fructification. The corolla affords none, being either of one or five petals, or altogether absent, as appears from a contemplation of the characters of the different genera. No mark is to be obtained from the nature of the fruit, that being either a berry, drupa, or capsule. The seeds in some instances are solitary, in others numerous, though never more than one in each cell; and it is well worthy of observation that they are attached, as in the *Gymnotetrasperma*, by their base. These plants betray some affinity to the *Tricocca*, but can never be referred to the same order."

In the Linnæan manuscript before us, *Diosma* and *Hartogia* are introduced between *Callicarpa* and *Euonymus*; —see our remark on the 26th order. *Staphylea* is also subjoined, near *Celastrus*, but with two marks of doubt, and a note of its having a nectary, as well as opposite leaves.

Order 44. SEPIARIÆ. "All these are shrubby or arborescent. Leaves opposite, with scarcely any evident stipulas. Flowers disposed in a more or less dense panicle. Calyx four-cleft. Corolla four-cleft, regular. Stamens two. Pistil one, with a cloven stigma. Fruit either a drupa, with one, two, or many, seeds, or a capsule."

No manuscript remark occurs here, nor is there any observation worth copying in the lectures, except that *Olea* is said by Linnæus to be scarcely a distinct genus from *Phillyrea*.

Order 45. UMBELLATÆ. "The name of this order is derived from the form of its inflorescence, whose stalks all spread from a centre, like the ribs of an umbrella."

"These plants are either perfectly umbellate or not. The former are required to have a compound umbel, each stalk, or ray, of which ends in a receptacle, producing other stalks bearing flowers, or florets; the latter have a simple umbel, whose stalks are not subdivided. The latter constitute a separate section in Tournefort's system. They are comprehended by Linnæus in one natural order with the former."

"An umbel is properly a receptacle of a compound flower, elongated into stalks; which manifestly appears in *Eryngium*, whose florets are united into a head, just like the proper compound flowers,—see the 49th order; nor are they supported by elongated stalks. Hence an umbel may accurately be considered as a compound flower. Those who controvert the opinion of Linnæus in this point contend, that many umbellate plants, having male and hermaphrodite flowers in the same species, ought to be placed in his class *Polygamia*. But this is a mistake; for no other plants ought to find a place in that class, than such as have distinct male, or female, as well as hermaphrodite, flowers, in the same species. This is not the case with the *Umbellatæ*, in which all the florets of one universal umbel, that is, the whole umbel itself, constitutes but one flower, and this flower is never

altogether barren, that is, its florets are never entirely male. On the contrary, these florets are to be considered as the parts of a compound flower; and there being male and hermaphrodite ones intermixed, is exactly a parallel case with the polygamy of the Syngenesious class."

"This order is eminently natural, though all plants which bear umbels do not belong to it, but only those with five stamens, two styles, and two seeds."

"The germen is inferior, simple, solitary, separating, when arrived at maturity, into two equal naked seeds; each of which is furnished with a thread, inserted into its summit. These two threads combine to form a very slender receptacle, at the top of the stalk of the floret. Each floret has a superior perianth, with five teeth, which is often so small as scarcely to be discerned, even with the help of a magnifier. Petals five, caducous, often unequal; hence Rivinus referred these plants to his class of pentapetalous irregular flowers. Stamens five, inserted into an elevated annular or circular receptacle, that surrounds the pistils, deciduous. Styles two, often very short, and hardly visible. Seeds naked, without any seed-vessel."

"The stem is mostly hollow, sometimes filled with spongy pith; rarely shrubby, very rarely arboreous, of which last character *Phyllis* is the only example,—see order 47. Leaves generally alternate, and repeatedly compound. Root mostly quite simple; in *Oenanthe* tuberous, in *Bunium* *Bulbocastanum* globose."

"Nothing is more arduous than to distinguish the genera of umbelliferous plants by appropriate characters. Tournefort himself, who excelled in the knowledge of this tribe," (perhaps Linnæus meant rather to say, in the discrimination of genera, but his auditors did not take his words accurately,) "has distributed them according to the shape and size of their seeds. But this is a very fallacious mode, as the seeds often differ much in proportion, though not in any other respect. Morison wrote an entire book on umbellate plants; but with little success, their

genera not being, as yet, established. Artedi first paid attention to the *involucrum*, which is either universal as well as partial, or only partial, or entirely wanting. This principle has likewise been adopted, as fundamental, by Linnæus, and his three primary divisions are regulated accordingly. The inequality of the petals affords him a principle for his leading subdivisions, some of the umbelliferous family having the outermost petals of their external florets larger than the rest ; while in others all the petals are equal. The former are termed radiant flowers. Another subdivision is taken from the sex of the florets. Some of these, having no germen, are furnished with stamens only ; and such florets are termed abortive ; others, having both germen and stamens, bring their fruit to perfection, and are therefore denominated fertile.”

On these principles Linnæus has arranged the umbellate plants, as may be seen in his works. Nothing occurs in his manuscript, except the insertion of *Hermas* next to *Eryngium*.

Order 46. *HEDERACEÆ*. The lectures give no new information concerning this order. The six genera stand as in the *Genera Plantarum* ; *Panax*, *Aralia*, *Zanthoxylum*, *Hedera*, *Vitis*, and *Cissus*.

Order 47. *STELLATÆ*. “ This order was founded by Ray, and received its name from the leaves of most of the plants which compose it being placed, four, six, or eight together, in the form of a star, round the stem. It is unusual to see more than two leaves opposite to each other, nor is it the case here. For two of these only are properly leaves, the rest being no other than stipulas, grown to the size of leaves. This appears evident in several Indian plants of the present order, as *Knoxia*, *Diodia*, &c. which have only two opposite leaves, though between these some small acute stipulas are found, being the same that in the rest of the order attain the magnitude of leaves. Ray believed all the plants of this order to have whorled leaves, which is generally the case, as far as regards those

of European growth, but rarely with the Indian ones, of which few were known in his time."

" In this order there is no tree, unless perhaps *Lippia*; there are very few shrubs, most of the tribe being small herbs, growing in barren earth, or coarse sand."

" The roots are in many instances perennial. Leaves opposite, horizontal, mostly rough. Stipulas of the form and aspect of leaves, so that it is impossible to say whether they be truly such or not, hence the leaves appear whorled; but this does not hold good universally. In those however which have no leafy stipulas, there is found, at each side, a sort of toothed membrane, connecting the leaves together, and occupying the place of stipulas."

" The stem is jointed, with mostly tumid knots. Corolla of one petal, either flat, wheel-shaped, or funnel-shaped; in one genus bell-shaped; mostly four-cleft, sometimes almost down to the base; rarely five-cleft. Stamens four, never eight, though sometimes five or six, in which case the corolla has a parallel number of segments. Pistil solitary, divided; in *Richardia* three-cleft, because that genus has a six-cleft corolla, six stamens, and a three-grained fruit, its parts of fructification being all augmented in a similar proportion. Those parts are not augmented with the same regularity in genera furnished with a three-cleft corolla, and five stamens, for their pistil is still bifid, and their fruit two-grained, as is the case with such as have a four-cleft corolla and four stamens.

" The fruit is, for the most part, inferior; though superior in *Houstonia*; and in *Crucianella* superior with respect to the calyx, though inferior to the corolla." This is incorrect, for *Crucianella* has a real superior perianth, like the rest of the order, though so small as to be hardly discernible; what Linnæus here terms calyx, being an involucre, or perhaps bractæas. " The sexes are rarely separated in this order, though *Valantia*, which is polygamous, can by no means be excluded from it. Many of

the genera have a two-grained fruit, of two cells, with a solitary seed in each. But in *Hedyotis* and *Oldenlandia* the cells contain many seeds; while in *Cornus* both cells are united into one seed, which, nevertheless, has two cells. The fruit has a green, fleshy, but not juicy, coat, nor does it usually become coloured in ripening; though in *Rubia* the fruit is a perfect berry."

(Of the remarks on particular genera, we find nothing to extract except the following.)

"*Asperula tinctoria* is used in Gothland instead of Madder, and is preferable."

"*Sherardia* has an oblong fruit, which the permanent calyx renders toothed, or crowned with three points. It was the fate of William Sherard, a man worthy in the highest degree of botanical honour, to have two different genera distinguished by his name, both which were afterwards referred to others. Pontedera, Vaillant, and Dillenius each published, at the same time, a *Sherardia*. Pontedera described his plant so very obscurely, that it was ten years before Linnæus made it out to be his own *Gallenia*. Vaillant called the two-seeded *Verbenæ* by the name of *Sherardia*, but he was to blame in separating them from their proper genus. Dillenius named a *Sherardia*, from among the *Stellatæ*, which Linnæus has retained, though not very certainly distinct. Being unwilling that so meritorious a botanist should remain without a memorial, Linnæus declined referring the plant in question to *Asperula*; especially as the three teeth, at the top of each seed, may serve, if not very satisfactorily, to keep it separate."

"*Valantia* was so named by Tournefort; but Vaillant, perceiving it to be the same with Tournefort's *Cruciata*, thought it a bad genus, which could not support itself. He therefore wished to abolish all generic names, given in honour of botanists, because he supposed his own was untenable. But Tournefort confounded several genera under the appellation of *Cruciata*, so that Linnæus has

been enabled to establish a *Valantia* from among them, referring the rest to their proper places."

Order 48. AGGREGATÆ. "These constitute a natural order, first established by Vaillant in the Memoirs of the French Academy of Sciences. They agree so far with the *Compositæ*, that they have generally a common calyx, as well as receptacle, containing many sessile flowers, each of which has always an inferior germen. But there is a total difference with respect to the remaining parts of fructification, nor can these two orders be, by any means, united."

"The calyx, as we have just said, is common to many flowers. Common receptacle either naked, villous, hairy, or scaly. In the place of a partial calyx is the corolla, generally of one petal, regular or irregular, in four or five divisions, rarely polypetalous. Stamens four, with separate anthers. Germen inferior. Fruit single-seeded. The flower is therefore complete in this tribe, except only *Valeriana*, whose calyx is scarcely apparent. The leaves are often opposite, and the stem shrubby."

Order 49. COMPOSITÆ. "A compound flower generally consists of a common calyx, containing several florets. But this definition is not sufficiently discriminative, for there are certain flowers termed *Aggregate*, which though they have numerous florets in one common calyx, are connected by no affinity whatever with these; witness *Cephalanthus*, *Dipsacus*, *Scabiosa*, *Knautia*, *Allionia*. Hence botanists have tried to discover an appropriate and distinguishing character for a compound flower, but they have scarcely succeeded. There are indeed flowers of this order, furnished with solitary florets in each calyx, as *Seriphium*, *Corymbium*, *Strumpfia*. All of them have a monopetalous corolla, but so has *Scabiosa* and others. Most have five stamens, but some have only four. The greater number bear their anthers united into a cylinder, but *Kuhnia*, which belongs to them, has separate anthers; while *Jasione*, *Viola* and *Impatiens*, which do not, have

combined ones. The united anthers burst internally, by which means their pollen is communicated to the stigma; but the anthers of *Kuhnia* open at the extremity, and resemble the corolla of an *Aristolochia*. All the florets are superior, but this holds good likewise in *Scabiosa*. Hence it appears that no essential character of compound flowers is to be detected, though no order can be more natural than that before us."

"Tournefort first divided the compound flowers into three sections, according to the shape of their partial corollas. These are either ligulate or tubular. Such as consist of ligulate florets only, are called by this writer *semiflosculosi*; such as are formed only of tubular ones, *flosculosi*; while those which have ligulate florets in the radius, and tubular ones in the disk, are denominated *radiati*. This division seems natural enough, and yet is not so. For it refers both the discoid and capitate compound flowers of Linnæus to the *flosculosi*, which nevertheless are too dissimilar to be possibly admitted into the same section. The *discoidei* of Linnæus, Ray's *aggregati*, having aggregate florets, seated on a hemispherical receptacle, are, in fact, more allied to the *radiati*; while the *capitati*, such as Thistles, are widely different, so as necessarily to constitute a division by themselves."

"Vaillant attempted a new botanical system; but it is to be lamented that we are possessed of no more of his labours, than what concerns the compound flowers. In this performance, published in the Memoirs of the Parisian Academy for the years 1718, 1719 and 1720; he has displayed an extensive knowledge of species, and has treated the subject admirably. As the Memoirs of the Academy are not within the reach of every body's purse, a German named Von Steinwehr has collected the anatomical, chemical and botanical papers, into an octavo volume, published in 1754 at Breslaw. In this Vaillant's treatises are preserved entire," (but in the German language.)

“ The florets of compound flowers are threefold with respect to sex, being either *hermaphroditi*, perfect, having the organs of both sexes ; female, destitute of anthers ; or neuter, deprived of both organs, and barren.”

“ Tournefort, Vaillant, Ray, and almost every botanist who has treated of this tribe, divide it into three or four orders, some of them adding the aggregate flowers to the compound ones, whence arises the fourth order. But they have not fixed limits to their orders, such being scarcely discoverable. The *semiflosculosi* and *capitati*, for instance, though apparently widely different, are proved nearly akin by *Scolymus* and *Elephantopus*. The former of these has all the habit of a *Carduus*, and yet all its florets are ligulate ; the latter is intermediate between the *semiflosculosi* and *capitati*, nor are we certain to which of these divisions it belongs. *Perdicium*, a new genus, connects *Inula*, which is radiated, with the semiflosculous genus *Hieracium*, so that accurate limits are hardly to be drawn between them. Most of the *semiflosculosi* are milky, but *Lapsana* and *Cichorium* want this quality.”

“ Section 1. *Semiflosculosi* ; all the florets ligulate.”

“ These genera are distributed, first by their receptacle, which is either chaffy, villous, or naked. In the next place, they are subdivided by the down of their seeds, *pappus*, which is either absent, or bristle-shaped, or hairy, or feathery. Thirdly, a peculiar distinguishing character is borrowed from the form or nature of their calyx.”

“ The quality of the *Compositæ* in general is innocent ; but some of the present section are milky, which secretion proves, by experience, somewhat of a poisonous nature. So *Lactuca virosa*, in a wild state, is as poisonous as opium ; yet by culture it becomes esculent and culinary, though still causing sleep by its debilitating power.” Linnæus surely could not mean that this and the garden lettuce are one species. It is possible his hearers mistook him.

“ There are no trees, and few shrubs, among the *semi-flosculosi*; no bulbs, scarcely a tuberous root, except in some species of *Hieracium*. Their flowers are mostly yellow; sometimes red underneath, as in *Leontodon*, *Hieracium* and *Crepis*;” (very rarely pink, in *Geropogon* and *Crepis*;) sometimes blue, in *Cichorium* and *Catananche*; never white.”

“ Section 2. *Capitati*; all the florets tubular, assembled into a head, in one common calyx.”

“ All these are prickly or spinous, and vulgarly called *Cardui*, Thistles. If however they were all considered as one genus, such a genus would prove too ample; hence it is best to separate them into several, though the task is very difficult. *Centaurea* belongs to them, though necessarily referred, in the sexual system, to the order *Polygamia-frustranea*. Its calyx, always tumid, and often spinous, proves its affinity. The most extensive genera of this section, *Carduus*, and *Serratula*, are the most difficult to distinguish; hence it is best to study the rest, in the first place, that those puzzling ones may prove easier.”

“ Vaillant divided this capitate tribe by the spines of their calyx, whether simple, spinous, or leafy. But the gradation is so imperceptible, that no accurate principles of discrimination are hence to be obtained. No plant of this section is milky, or poisonous, or arboreous. Some of the *Serratulæ* are shrubby; many of the herbs are destitute of stems, as in *Carlina*, *Atractylis*, *Onopordum*, *Carduus*, and *Centaurea*.”

“ *Atractylis* has a radiant flower, and the florets of the radius have each both stamens and pistil, a solitary instance among compound flowers, rendering the genus very distinct. The elongated and coloured scales of the calyx in *Carlina* have misled Tournefort to rank it among radiant flowers.”

“ The *capitati* have a character peculiar to themselves, in the dilatation, or inflation, of the tube of each floret,

just below the limb, which causes their florets to project, in a more elongated manner, than in the *discoidei*, or other compound flowers."

"Section 3rd. *Discoidei*. The first subdivision of these, *polygami equalis*," (consisting of such as have all the florets furnished with stamens and pistils, and all producing seed,) "are distributed according to the receptacle, whether naked, chaffy or hairy, and their seed-down, like the *semiflosculosi*."

"The second subdivision, *polygamia superflua*, have female florets in the circumference, but these are tubular, not ligulate or radiant. So that the flowers, though they have a marginal series of female florets, cannot be called radiated." We have here extracted the ideas of Linnæus from his remarks on *Artemisia*, which seem to refer to the whole of this subdivision, and are certainly correct, though they interfere with the distribution of the order before us in the *Genera Plantarum*, and seem to have been unintelligible to the editor of the *Prælectiones*;—see his note in p. 539 of that work.

"Section 4th. *Radiati*." (Marginal florets radiant.) "The first subdivision is *polygamia superflua*," (all whose florets are capable of producing perfect seed, though the marginal radiant ones have no stamens.)

These are distinguished by the presence or absence of seed-down, or of a membranous border to the seed, and by the nature of their receptacle, whether naked or chaffy.

The second, *polygamia frustranea*, have imperfect or defective female or neuter florets in the circumference, producing no seed. These in *Centaurea* are tubular, and neuter; in the rest ligulate, furnished with rudiments, more or less evident, of a pistil.

The third, *polygamia necessaria*, have effective seed; bearing female florets in the circumference only.

"Section 5th. *Monogamia*." (Such as have but one floret in each partial calyx.)

Seriphium, Corymbium, and Strumpfia.

“None of the *Compositæ* are poisonous, except *Tagetes, Doronicum, and Arnica*; the latter is more so than *Doronicum*. They contain much of a bitter flavour; hence many of the order are medicinal and strengthening. Some, less bitter, as *Arctium, Cynara, Carduus*, are therefore esculent. Many *semiflosculosi* are used as food, though furnished with a milky juice, which in them is not poisonous,” (see a remark under Order 30th.) “except *Lactuca virosa*, whose juice as above mentioned, has the quality of opium, and *L. sativa* has a soporific virtue. Boiling entirely destroys the power of this, as well as of the other *semiflosculosi*.”

Order 50th. *AMENTACEÆ*. “An *amentum*, catkin, is a species of calyx, and very like a spike, consisting of a common receptacle, drawn out like a thread, on which the flowers stand in alternate order, subtended by scales or bracteas. Such a calyx is found in the plants of this order, whence Linnæus gave it the above name. They are all either trees or shrubs, with alternate leaves, and separated male and female flowers, being either monoecious or dioecious. Many of them produce but one seed from each flower; but *Salix* and *Populus* bear a seed-vessel of two valves, with many seeds. The styles are usually two or three. The flowers come before the leaves, that the latter may not hinder the access of the pollen of the male to the female blossoms.”

“Monoecious genera are *Betula, Carpinus, Corylus, Quercus, Juglans, Fagus, and Platanus*.”

“Dioecious ones *Pistacia, Myrica, Populus, and Salix*.”

Order 51st. *CONIFERÆ*. “These are generally evergreen trees of cold climates. In the Indies almost all the trees are evergreen, and have broad leaves; but in our cold regions most trees cast their foliage every year; and such as do not, bear acerose, that is, narrow and acute, leaves. If they were broader, the snow which falls

during winter would collect among them, and break the branches by its weight. Their great slenderness prevents any such effect, allowing the snow to pass between them. This precaution is unnecessary in India, where snow is unknown. Nevertheless, *Liquidambar* is to be referred to this order, though it bears no such slender, but rather broad, foliage ; nor is it a native of a cold country."

"The plants of the present order are denominated *Coniferæ*, because they bear *Strobili*, which the older botanists called *Coni*, Cones. A cone and a catkin are closely related to each other. The latter bears several imbricated flowers about a common receptacle or axis. Under each flower a membranous scale or bractea is attached, which if it hardens and becomes woody, the catkin becomes a cone. Hence a cone is nothing more than a permanent or hardened catkin."

"All the *Coniferæ* properly bear cones, though in some instances their fruit seems of a totally different nature. For instance, the fruit of *Juniperus* has all the appearance of a berry, and is universally so called. Yet it is no other than a *strobilus*, whose scales are replete with pulp, and do not split asunder ; being in fact six fleshy united scales, in each of which is concealed a solitary seed. *Taxus* has a berry, which is merely a fleshy receptacle, dilated so as nearly to cover the seed, so that the apex of the latter only appears. *Liquidambar* has a singular kind of fruit, which nevertheless is a *strobilus*, whose scales are combined, each of them containing several seeds ; whereas in other instances one or two seeds only belong to each scale."

"Some have united this order with the last, but they differ essentially. The *Coniferæ* have not only hardened scales, but likewise monadelphous stamens, the filaments of all of them being combined at the base."

"The fruit in this whole order, *Liquidambar* excepted, is biennial. It is produced in the spring, remaining in an unripe state through the summer, and till the following

spring, when it gradually ripens, and the gaping scales allow the seeds to escape."

Order 52nd. COADUNATÆ. On this order there is no observation in the lectures. *Illicium* is added in manuscript to the genera in *Gen. Pl.*

Order 53rd. SCABRIDÆ. Here also the lectures are silent. *Forskohlea* and *Trophis* are added in the manuscript.

Order 54th. MISCELLANÆ. Here, although no remark is preserved in the lectures, great corrections are made in the manuscript. The genera in the second section, *Poterium* and *Sanguisorba*, are referred to the 35th order, immediately before *Agrimonia*. *Pistia* and *Lemna*, constituting the 3rd section, are transferred to the 15th order. The six genera which compose the 5th section, are sent to the 4th section of the *Holeraceæ*, order 12th. *Nymphæa* and *Sarracenia*, the only plants of the 6th section, are referred, as already mentioned, first to the 27th order, but finally, not without a doubt, to the 11th. See the observations under those orders. *Cedrela* and *Swietenia*, which make the 7th section, are removed to the *Trihilatæ*, order 23rd. *Corrigiola*, *Limeum* and *Telephium*, the 8th and last section, are transferred to the 5th section of the 12th order, *Holeraceæ*. No genera therefore remain in this 54th order, but *Reseda*, *Datisca*, *Coriaria*, and *Empetrum*.

Order 55th. FILICES.

—— 56th. MUSCI.

—— 57th. ALGÆ.

—— 58th. FUNGI.

Nothing occurs here, either in the *Prælectiones* or the manuscript, to the purpose of our present inquiry, concerning the ideas of Linnæus on natural classification. These orders are all natural, and acknowledged as such by all systematics. His particular observations on each, although in many points curious, are now superseded by

the advanced state of botanical knowledge in the cryptogamic department.

From the foregoing copious exposition of the general principles, and many of the particular opinions of Linnaeus, respecting a natural classification of plants, it will appear how far he was from considering his performances, in this line, as complete. His leading ideas may, nevertheless, be traced, and they will often be found to throw great light upon the subject. It must be remembered that he never thought his own, or any other, scheme of natural classification, could or ought to interfere with his artificial system, nor does he ever advert to the one in treating of the other. It is evident, likewise, that he studiously discouraged any attempt at an uniform definition, or technical discrimination, of his several orders. He perceived that plants were not yet sufficiently known to render such a scheme practicable. Possibly he might be aware that the accomplishment of that scheme at present would only turn his natural system into an artificial one.

The authors of most plans of botanical classification have, on the other hand, seldom considered the questions of natural and artificial arrangement, as opposed to each other. The system of every such author seems to have appeared to himself the most consonant to nature, as well as the most convenient in practice; yet nothing betrays a more absolute incompetency to the subject than such an idea, wherever it makes itself manifest. To pretend that the elaborate speculations of a proficient, on a subject of which he can see but a part, and on which his knowledge must necessarily be inferior to that infinite wisdom which planned and perfected the whole; should be an easy and certain mode of initiation for a learner, evinces no more than that the professor wishes his pupil should not be wiser than himself. To teach composition without a grammar, or philology without an alphabet,

would be equally judicious. Plants must be known before they can be compared, and the talent of discrimination must precede that of combination. Clearness and facility must smooth the path of the tyro ; difficulties, exceptions, and paradoxes must be combated and unravelled by an adept. The knowledge of natural classification therefore, being the summit of botanical science, cannot be the first step towards the acquirement of that science. No person surely, who has published a natural system, without knowing all the plants in the world, will suppose that he has removed every present obstacle, much less anticipated every future obscurity, so that no insuperable difficulty can occur to the investigator of plants by such a system. Neither can any artificial system claim such perfection. But they may combine their powers, and cooperate in instruction. The one may trace an outline which the other may correct and fill up. The first may propose, and the second elucidate ; the former may educate and improve the memory and observation, for the use of the latter. When they oppose each other, their several defects and weaknesses appear ; by mutual assistance they strengthen themselves.

Whether the leaders of natural system in the French school of botany have thought with us on this subject, it might seem invidious to inquire too nicely. It were too much to expect that every one of their pupils, half learned and half experienced, however commendable their zeal and enthusiasm, should have done so. Nor is science in any danger if they do not. They must improve the system of Jussieu, before they can overturn that of Linnæus ; and if this were accomplished, the nomenclature and definitions of the learned Swede would still form an impregnable fortress, before which they must perish, or seek for shelter within. This dilemma has been, long ago, but too clearly perceived by the rivals of the fame of Linnæus, particularly by such of the French school as have been actuated by a truly contemptible national partiality,

instead of a disinterested love of science and truth. Hence the so often repeated exclamations against Linnæus, as a mere nomenclator. Of his didactic precision, and philosophical principles of discrimination, such critics were not jealous, for they could not estimate the value nor the consequences of these. But they could all feel that the nomenclature of Tournefort was giving way, and that their efforts to support it were vain. The writer of these remarks has perceived traces of this feeling in almost every publication and conversation, of a certain description of botanists. He has likewise perceived that it would gradually subside, and that the interests of science were secure. The nomenclature of Linnæus has in the end prevailed, and it were unjust now, to the greatest botanists of the French school, to deny them the honour of liberality on this head.

It is time for us to close this article, with a view of the principles, upon which the eminent systematics, to whom we have so often alluded, have planned and executed their schemes of botanical classification.

Here the learned and truly estimable Bernard de Jussieu, the contemporary of Linnæus in the earlier part of his career, first claims our notice. This great practical botanist, too diffident of his own knowledge, extensive as it was, to be over anxious to stand forth as a teacher, did not promulgate any scheme of natural arrangement till the year 1759, when the royal botanic garden at Trianon was submitted to his direction. His system was published by his nephew in 1789, at the head of his own work, of which it makes the basis. It appears in the form of a simple list of genera, under the name of each order, without any definition, just like the *Fragmenta* of Linnæus, at the end of his *Genera Plantarum*.

In 1763 a very active and zealous systematic, M. Adanson, made himself known to the world by the publication of his *Familles des Plantes*. In this learned and ingenious, though whimsical and pedantic, work, the great

task of defining natural orders by technical characters is first attempted. His affected orthography and arbitrary nomenclature render it scarcely possible, without disgust, to trace his ideas ; which however, when developed, prove less original than they at first appear. His work is written avowedly to supersede the labours of Linnæus, against whom, after courting his correspondence, he took some personal displeasure ; and yet many of his leading characters are borrowed from the sexual system. The discriminative marks of his 58 families are taken from the following sources—leaves, sex of the flowers, situation of the flowers with respect to the germen, form and situation of the corolla, stamens, germens, and seeds. Every family is divided into several sections, under each of which the genera are in like manner synoptically arranged, and discriminated by their leaves, inflorescence, calyx, corolla, stamens, pistil, fruit, and seeds. In the detail of his system, Adanson labours to upset the principle, so much insisted on by Linnæus and his school, and to which the great names of Conrad Gesner, and Cæsalpinus are chiefly indebted for their botanical fame, that the genera of plants are to be characterized by the parts of fructification alone. The experienced botanist knows that this is often but a dispute of words ; Linnæus having, in arranging the umbelliferous plants, resorted to the inflorescence, under the denomination of a receptacle ;—see his 45th natural order. But it appears to us that the characters deduced from thence are in themselves faulty, being often uncertain, and not seldom unnatural ; and that the plants in question may be better discriminated by their flowers and seeds. Adanson however prefers the inflorescence, even in the *Verticillatæ* of Linnæus ; for no reason, that we can discover, but because Linnæus has so much better defined the genera of those plants by the *calyx* and *corolla*. It were a needless and ungrateful task to carp at the mistakes of this or any writer on natural classification, with regard to the places allotted for difficult genera, be-

cause the human intellect must falter in unravelling the intricate mysteries of Nature. But surely, when *Plantago* is placed with *Buddlæa* in one section of the *Jasmineæ*, and *Diapensia* with *Callicarpa* in another; when the most natural genus of *Lavandula* is divided and widely separated; when *Cassythia* is ranged with *Statice*, *Eriocaulon*, and the *Proteaceæ*, in one place; *Geoffræa* with *Melia*, *Rhus*, *Sapindus* and *Ruta* in another, we may be allowed to wonder, and to doubt whether we are contemplating a natural or an artificial system. It does not appear that Adanson made many proselytes. He haunted the botanical societies of Paris in our time, without associating with any; nor was his extensive knowledge turned to much practical account. Linnæus has made but one slight remark, that we can find, in his own copy of the *Familles des Plantes*, nor could he study deeply what was, undoubtedly, very difficult for him to read. He certainly never noticed Adanson's attacks, unless the satirical sketch of the *Botanophili*, at the end of his *Regnum Vegetabile*, (see the beginning of *Syst. Veg. ed. 14.*) be partly aimed at this author. To apply the whole of it to him would be unjust, though much is very characteristic.

The study of botany had never been entirely neglected in France since the days of Tournefort; because one department in the Academy of Sciences was allotted to that and other branches of Natural History, and the seats in the Academy being pensioned places under government, there was something to be got by an apparent attention to such pursuits. Buffon and his pupils engrossed Zoology. Botany was allowed to exist, so far as not to interfere with his honours; but nothing of foreign origin, and above all, nothing Linnæan, dared to lift up its head. Something of true science, and practical knowledge, did nevertheless imperceptibly work its way. Le Monnier, and the Marechal de Noailles, corresponded, as we have already said, with Linnæus, and acquired plants from England, of which they dared to speak, and to write, by

his names. A most able and scientific botanist and cultivator, Thouin, was established in the Jardin du Roi, who studied the Linnæan system, and even ventured, though secretly, to communicate new plants to the younger Linnæus when at Paris. Cels, an excellent horticulturist, was unshackled by academic trammels. L'Heritier, Broussonet, and others came forward. An original letter of Rousseau, the idol of the day, in which he paid the most flattering homage to botany and to Linnæus, was published in the Journal de Paris, and had a wonderful effect on the public mind, and on the conversation of literary circles. In short, a Linnæan party had been, for some time, gaining ground; and every thing was done by party at Paris. The old French school was roused from its slumbers. Of the family of the Jussieus one individual remained, who, though he venerated the names and the pursuits of his uncles, had never devoted himself to their studies any further than to sit in their professorial chair. He possessed however an inherent taste for Botany; he had leisure, opulence, and eminent talents; and though his religious principles, and his rather strict devotional habits, might interfere, which they still do, with his credit in certain philosophical circles, and his predilection for animal magnetism might exclude him from the Royal Society of London, yet he has risen above all such obstacles, to the summit of botanical fame and authority in his own country; and his name stands conspicuous, as the leading teacher of a natural classification of plants. The most indefatigable study for about five years, and the constant assistance and encouragement of numerous pupils and correspondents, enabled Professor Antoine Laurent de Jussieu to publish, in 1789, his *Genera Plantarum secundum ordines naturales disposita*. This octavo volume was received by acclamation throughout Europe, and hailed as the most learned botanical work that had appeared since the *Species Plantarum* of Linnæus.

Before we enter into systematic details, we must remark,

that the author of the work before us has judiciously availed himself of the mode of defining genera, by short *essential* characters, as introduced by Linnæus in the 10th edition of his *Systema Naturæ*, and since adopted by Murray, Willdenow, and the generality of botanists, instead of the full or *natural*, characters, of the Linnæan *Genera Plantarum*. These short characters however are not servilely copied by Jussieu, but wherever he had materials they are revised and studied, so as to acquire all the merit of originality. Secondary characters and remarks are subjoined, in a different type, illustrative of the habit, history, or affinities, of the several genera. In his nomenclature Jussieu almost entirely follows Linnæus, retaining only here and there a name of Tournefort's, in preference, and swerving from classical taste and correctness principally with regard to the new genera of Aublet, whose intolerably barbarous names are nearly all preserved. But a note in the preface, p. 24, informs us, that this adoption is only temporary, till the genera themselves shall be perfectly ascertained and defined. Where Jussieu differs from Linnæus, in certain generic appellations, it is principally because the latter fails in respect for his own laws; as in the use of adjectives, like *Gloriosa*, *Mirabilis*, *Impatiens*. The inordinate abuse of generic names in honour of botanists, of which Linnæus is, too justly, charged with setting the example, meets with due reprobation from the French teacher; but he has not as yet stemmed the muddy torrent, nor prevented a great additional accumulation of subsequent impurities. His commendation of Linnæus, as the author of a new and commodious system of specific nomenclature, as well as of technical definition, on the best principles, is liberal, manly and just, no less honourable to the writer, than to the illustrious subject of his remarks. The whole preface of Jussieu is a concise and learned review of the physiology and distinctions of plants, more particularly explaining the progress of the author's ideas and principles of botanical classification.

The main end of the whole book, besides defining the characters of all known genera, is to dispose them in a natural series, in various classes and orders, whose technical distinctions are throughout attempted to be fixed and contrasted. With this view, copious explanations and commentaries accompany each other. We learn more from the doubts of Jussieu, than from the assertions of Adanson. The latter has presented us with a finished system, where every genus is referred, at all hazards, to some place or other. Jussieu, on the contrary, has not only a large assemblage of *Plantæ incertæ sedis*, at the conclusion of his system, like Linnæus; but at the end of most of his individual orders we find some genera classed as akin thereto, without answering precisely to the character, or idea, of each. This circumstance, though highly creditable to the candour and good sense of the author, greatly interferes with the practical use of his book, except for the learned. His judicious doubts, critical remarks, and especially the laxity, and consequent feebleness, of his definitions, though eminently instructive to those who want to define, or to class, a new, or obscure genus, could only bewilder a learner of practical botany. A person must already be deeply versed in plants, before he could, by the work of Jussieu, or by any book, that we have seen, classed according to his method, refer any genus to its proper place, or detect any one that may be there described. Nor does the difficulty to which we allude consist so much in the intricacy of the subject, as in the uncertainty, hesitation, and insufficiency of the guide; because that guide, learned as he is, chooses to conduct us by a path, to which neither he nor any other mortal has a perfect clue. His index indeed must be the resource of a young botanist; who, if he knows a *Rosa*, a *Convolvulus*, or an *Erica*, may, by finding their places and their characters, trace out the allies of each, and proceed step by step to acquire more comprehensive ideas. The analytical mode of inquiry, which serves us in the artificial

system of Linnæus, is here of no avail but to an adept. This will abundantly appear as we trace the leading principles of this celebrated method, of which we shall now attempt a concise exposition.

THE SYSTEM OF JUSSIEU

Consists of fifteen classes, which are composed, all together, of one hundred orders. The characters of the classes depend first on the number of cotyledons; next the number of petals, and the situation, or place of insertion, of the stamens and corolla.

The author uses the term *stamina hypogyna* for such stamens as are inserted into the receptacle, or below the germen, which therefore we shall call *inferior stamens*; *stamina perigyna*, (around the germen,) are inserted into either the corolla or calyx, the germen being superior; these we must denominate *perigynous*; *stamina epigyna*, *superior stamens*, are inserted above the germen, which latter is therefore, in Linnæan language, *inferior*. The same terms apply to the corolla, which when inserted into the calyx is denominated *perigynous*. The following table will show the characters of Jussieu's Classes:

Cotyledons none.

Class 1st.

Cotyledon one.

Class 2nd. Stamens inferior.

—— 3rd. Stamens perigynous.

—— 4th. Stamens superior.

Cotyledons two, (or more).

Class 5th. Petals none. Stamens superior.

—— 6th. ——— Stamens perigynous.

—— 7th. ——— Stamens inferior.

—— 8th. Corolla of one petal, inferior.

—— 9th. —————, perigynous.

Class 10th. Corolla of one petal, superior. Anthers combined.

—— 11th. ————, ————. Anthers distinct.

—— 12th. Corolla of several petals. Stamens superior.

—— 13th. ————. Stamens inferior.

—— 14th. ————. Stamens perigynous.

—— 15th. Stamens and pistils in separate flowers.

In the first place, it is evident that the great hinge, on which this system turns, is the number of the cotyledons. The importance of this character has, from the time of Cæsalpinus and Jungius, been much insisted on. Linnæus, in his *Prælectiones*, p. 329, declares his opinion, that “the monocotyledonous and dicotyledonous plants are totally different in nature, and cannot be combined;” and that “if this distinction falls to the ground, there will never be any certainty. Not that characters should be taken from hence, but sections when formed should be confirmed by the cotyledons.” - So jealous was this great man of any definition of his natural orders! He subjoins an exception to the above rule, in *Cuscuta* and *Cactus*, which having no leaves, he supposes have no occasion for cotyledons. Linnæus proceeds to observe that “the germination of parasitical plants requires investigation, but that he should greatly wonder if they have any cotyledons.” We have already, under the 11th of his natural orders, pointed out other exceptions, made by himself, to the rule just mentioned; but in these he was partly, as we have shown, mistaken; and had he been explicit about the *Sarmentaceæ*, he probably would have proved himself in an error likewise with respect to them. So Adanson asserts the *Juncus* to have two cotyledons, though the rest of its natural order have only one. But Gærtner has demonstrated this genus to be monocotyledonous. Adanson mentions *Orobanche* and *Cuscuta* as

monocotyledonous, which answers to the opinion of Linnaeus, but we know not how far this is just.

It appears that the line is distinctly drawn by nature between plants with a simple or no cotyledon, and others with two, or more, and that, so far, the principle of Jussieu's classification is correct. Whether all the genera that he has considered as monocotyledonous be truly so, is another question, which does not at all invalidate the distinction. Some have not been examined, and seem principally to be referred to that tribe, because, like others that indubitably belong to it, they are aquatics; or, at least, because of the apparent simplicity of their general structure. Doubts are expressed on this subject by Jussieu himself respecting *Valisneria*, *Cyamus* (his *Nelumbium*), *Trapa*, *Proserpinaca*, and *Pistia*. Some other genera, ranked as acotyledonous, are involved in similar uncertainty.

But with regard to the bulk of the *Acotyledones*, composing the first of Jussieu's classes, there seems to us much greater difficulty. Of his first three orders, *Fungi*, *Algæ*, and *Hepaticæ*, nothing indeed is correctly known, except perhaps what Hedwig has published concerning *Marchantia* and *Anthoceros*, and that is hardly sufficient for our purpose. With the fourth order, *Musci*, this great cryptogamist has made us so well acquainted, that they prove to be any thing else than acotyledonous, or monocotyledonous; at least if his idea of the parts be right. The parts which he takes for cotyledons are peculiarly numerous and complicated; but we are ready to allow with Mr. Brown, at the conclusion of the preface to his *Prodromus Floræ Novæ Hollandiæ*, that these organs are of a most uncertain nature, rather subsequent to germination than its first beginning, like what has been judged the cotyledon of Jussieu's 5th order, the *Filices*. Yet hence a new difficulty arises. The parts in question so complex in *Musci*, are simple in *Filices*, insomuch that no analogy between these orders, otherwise so nearly akin, is to be

traced in those parts. On the other hand, it cannot be concealed that the plants termed *monocotyledones* have no cotyledon at all analogous to those of the *dicotyledones*; what Jussieu and others call such, being the *albumen* of the seed, absorbed in the first stage of vegetation. The minute plants assumed to be acotyledonous, must be presumed to be furnished with something analogous, or we cannot conceive how vegetation can take place. By all these observations we mean only to show, that the primary divisions of Jussieu's system are at least totally insufficient to answer that practical purpose, which a student has a right to expect from any methodical arrangement. If the learned be still uncertain, whether the distinctions, on which such divisions are founded do, in a great number of cases, really exist, how can a beginner regulate his first inquiries thereby? We are not the less ready to confess, that the difficulty in question is rather a philosophical speculation, than of any great practical importance. It gives a venerable air of mystery, which may procure respect for other parts of a system, that are more intelligible and more useful, though not free from exception. We allude to the next subdivision of the method of the great French teacher, founded on the petals. This should seem to be obvious and certain, but we soon find ourselves bewildered in an old labyrinth of dispute, concerning the difference between a *calyx* and a *corolla*. We are obliged to submit to a sweeping decision, which allows no *corolla* to monocotyledonous plants; a decision which we cannot safely combat, because of the difficulty of deciding what are such, but which shocks our senses and our judgement, and seems refuted in many instances by Nature herself, as decidedly as any of her laws can be established. Nor do we get clear of this perplexity among the declared dicotyledonous tribes, where the evident *corolla* of the Marvel of Peru is assumed to be an inner *calyx*, there being a real *perianth* besides, subsequently indeed called an *involucrum*. Yet we are at a loss to discern why the ter-

minology here used, should have been different from that applied to the next order, *Plumbagines*. We are ready, most unreservedly, to admit the great difficulty of decision in these cases, as well as in others, occurring in Jussieu's 5th, 6th, and 7th classes; but that very difficulty evinces the precariousness of making any thing connected with this most disputable of all questions, a primary guide in a system of methodical arrangement. When we proceed a step further, and come to the insertion of the stamens, the convenience and clearness of the system indeed improve upon our view; but we must not hope to escape exceptions or inaccuracies, the connection of the *filaments* with the *corolla* being, by no means, uniform or constant, in the orders so characterized, nor even in all the species of particular genera, classed upon that principle. So likewise the insertion of the *stamens* into the *calyx* is attended with such inveterate difficulties, that one of the warmest promulgators and defenders of Jussieu's system, Mr. Salisbury, has thought it easier to deny the existence of any such insertion, than to make it subservient to practical use. We are indeed satisfied that the characters throughout the celebrated method of classification now under our contemplation, are attended with as much difficulty and exception as those of any other system; and we cannot but agree with Mr. Roscoe, *Trans. of the Linn. Soc.* vol. xi. 65, that it forms several as unnatural assemblages as even the professedly artificial system of Linnæus. With regard to practical facility, no person of judgement has ever attempted to invalidate the superiority of the latter.

Having fulfilled the invidious task, which truth has required of us, let us turn to the more pleasing one of pointing out some of the great practical advantages of the labours of Jussieu.* We do this with the more readiness, because we conceive that his real merits are better understood in England than any where else. The writer of this cannot disclaim the honour of being the first who

announced to his countrymen the performance of his illustrious friend and correspondent, as one of the most learned books ever published. He humbly conceives that few persons, in any country, have studied the work more, or applied it so much to practice. If he has been fortunate in establishing genera, which have not been controverted, he allows his obligations to Jussieu, as much as to Linnæus. The treasures of neither lie on the surface, nor are they to be appreciated by a superficial observer. The foolish contentions of party can neither exalt nor invalidate the reputation of such men; nor is it the counting of stamens and pistils, nor the enunciation of the names of natural orders, implying ideas which do not always exist in the mind of the speaker, that can entitle a pedant or coxcomb to rank as the pupil of either.

We confess ourselves somewhat partial to the Linnæan notion, of conceiving the idea of a natural order in the mind, rather than to the Jussieuan attempt at very precise technical limitation of its characters. If we contemplate the generality of Jussieu's orders in this light, we shall be struck with his profound talents for combination, as well as discrimination; and as we peruse his critical remarks, subjoined to several of these orders, we shall profit more by his queries and difficulties, than by those definitions, at the head of each order, which are, too often, so clogged with exceptions, as to bewilder rather than instruct a student, however intelligible they may be to an adept.

The uninformed reader may, possibly, be surprised to see how great a conformity there is between most of the Natural Orders of Linnæus and those of Jussieu. This will appear by a cursory view of the latter, which, after the detail we have given of the former, will more elucidate the subject than any other explanation that our limits will allow. We shall take the orders of Jussieu in their regular series.

CLASS 1.

The first five orders, *Fungi*, *Algæ*, *Hepaticæ*, *Musci*, and *Filices*, are the same in both systems, except that Linnæus does not separate the *Hepaticæ* from *Algæ*.

6. *Naiades* are analogous to the *Inundatæ*, ord. 15, of Linnæus.

CLASS 2.

7. *Aroideæ* answer to the Linnæan *Piperitæ*, ord. 2, though *Piper* itself is removed far away, to the *Urticæ*.

8. *Typhæ* consist of *Typha* and *Sparganium*, two genera first referred by Linnæus to *Calamariæ*, then to *Piperitæ*.

9. *Cyperoideæ* are the Linnæan *Calamariæ*, ord. 3.

10. *Gramineæ* are the *Gramina*, ord. 4, grasses, an order about which there cannot be two opinions, nor do these authors differ, except in the denomination of the integuments of the flower; Jussieu calling the *calyx* a *gluma*, and the *corolla* a *calyx*. This alteration is made, chiefly that he might not allow a *corolla* to monocotyledonous plants.

CLASS 3.

11. *Palmæ*, palms, necessarily the same in both systems.

12. *Asparagi* answer to the bulk of the *Sarmentaceæ*, ord. 11.

13. *Junci* agree less exactly with *Tripetaloidæ*, ord. 5, both being liable to exceptions, and having undergone subsequent corrections by their respective authors.

14. *Lilia* consist of the latter portion of Linnæus's *Coronariæ*, ord. 10, with the beginning of his next order *Sarmentaceæ*.

15. *Bromeliæ* embrace some others of the *Coronariæ*, about which Linnæus had his doubts to the last, nor is Jussieu satisfied with this order.

16. *Asphodeli* are likewise chiefly *Coronariæ*, except *Allium*.

17. *Narcissi* are Linnæan *Spathaceæ*, ord. 9. We say

nothing of anomalous or doubtful genera, subjoined to this or any other order, and which are sometimes numerous, not unfrequently paradoxical. In the present instance they are *Hypoxis*, *Pontederia*, *Polianthes*, *Alstroemeria*, and *Tacca*, concerning which, the intelligent reader will readily concur with the learned author, that they are “genera *Narcissis non omninò affinia*.”

18. *Irides*—Linnæan *Ensata*, ord. 6.

CLASS 4.

19. *Musæ*—consist of *Musa*, very mistakenly referred by Linnæus to his *Scitamineæ*; with *Heliconia* and *Ravenala*, Schreber's *Urania*, both nearly akin to *Musa*.

20. *Cannæ* are the *Scitamineæ* of Linnæus, ord. 8.

21. *Orchideæ* are his *Orchideæ*, ord. 7.

22. *Hydrocharides* are an assemblage of water plants, having little else in common. *Valisneria*, *Hydrocharis*, and *Stratiotes*, make a sort of appendix to the Linnæan *Palmeæ*. For *Nymphæa* and *Nelumbium* (now called *Cyamus*), see our remarks on the 11th, 54th, and 27th, of the Linnæan orders. *Trapa*, *Proserpinaca* and *Pistia* close the list. Linnæus has the two last in his *Inundata*, ord. 15.

CLASS 5.

23. *Aristolochiæ* compose the end of the Linnæan *Sarmentaceæ*, but were afterwards removed to the *Rhoeadeæ*, ord. 27. They are surely best by themselves, and constitute a very natural order, not detected by Linnæus.

CLASS 6.

24. *Elæagni* consist of Linnæan *Calycifloræ*, ord. 16, with various genera besides, referred to almost as many different orders by Linnæus, so that here the two systems exhibit but little analogy, nor is this one of Jussieu's best orders.

25. *Thymelææ*, *Vepreculæ* of Linnæus, ord. 31, (the *Daphne* tribe,) are very clearly defined.

26. *Proteæ*, an order scarcely known to Linnæus, though an extremely natural one. It makes a part of his

Aggregatæ, ord. 48, in the establishing of which, a sort of artificial character, expressed in the name, has led him into unnatural combinations; a fault which Linnæus, more than any other writer in this department, has generally avoided.

27. *Lauri*, a very good order, not perceived by Linnæus. We cannot say much for the genera of *Myristica* and *Hernandia* annexed to it.

28. *Polygoneæ* make a part of the Linnæan *Holeraceæ*, ord. 12.

29. *Atriplices*, another portion of the same.

CLASS 7.

30. *Amaranthi*, these, originally a part of the *Miscellaneæ*, ord. 54, were also referred subsequently to the *Holeraceæ*. They are supposed to differ from Jussieu's two preceding orders, in having the stamens inserted into the receptacle, not into the calyx, hence forming a separate class. But there is no instance perhaps in which his system proves more artificial, and at the same time more uncertain in character. Mr. Brown has anticipated the latter part of our remark in his *Prodromus*, 413, nor could it fail to strike any one who ever considered the subject.

31. <i>Plantagines</i> .	{ Linnæus has no order analogous to these. Yet he has left manu- script indications of his perceiving the affinity of some of the genera.
32. <i>Nyctagines</i> .	
33. <i>Plumbagines</i> .	

CLASS 8.

34. *Lysimachiæ* embrace many of the *Rotaceæ*, ord. 20, and *Preciæ*, ord. 21. *Globularia*, *Tozzia*, *Samolus*, *Utricularia*, *Pinguicula*, and *Menyanthes*, subjoined as allies, not indeed without many doubts, appear to us greatly misplaced. The first of these is allowed to indicate an order not yet defined.

35. *Pediculares*, an important order, which Jussieu has well selected out of the Linnæan *Personatæ*, ord. 40;

though we are somewhat startled at finding *Polygala* at the head of the list, which Linnæus, not more happily perhaps, ranges with his *Lomentaceæ*, ord. 33.

36. *Acanthi* are a few more of the *Personatæ*.

37. *Jasmineæ* are precisely the Linnæan *Sepiariæ*, ord. 44.

38. *Vitices* consist of more *Personatæ*, separated with judgement from the rest. Linnæus having, in the contemplation of his 40th order, been again seduced by artificial principles, and by the usage perhaps of considering his *Didynamia Angiospermia* as of itself a natural order.

39. *Labiataæ* are precisely the *Verticillatæ*, ord. 42, of Linnæus, a tribe about which no two systematics could differ, and which it is one of the greatest evils of the artificial sexual system to be obliged to disjoin.

40. *Scrophulariæ* are more of the *Personatæ*, ranged here, after the *Labiataæ*, on account of the close affinity of several of them to the next order. But it must be confessed that the *Labiataæ* thus come awkwardly between what are strictly akin, and that this intrusion is a great flaw in the natural character of the system; insomuch that we should gladly remove them to another place, between the *Solaneæ* and *Borragineæ* hereafter mentioned.

41. *Solaneæ* consist principally of *Luridæ*, ord. 28, to which a few more of the *Personatæ* are subjoined as allies. It is remarkable that, in his characters of the seven last-mentioned orders, Jussieu admits those marks, derived from the stamens, on which the classes of the Linnæan artificial system depend. The intelligent reader will easily observe, that the distinctions thence deduced, form a leading principle in the respective positions of these orders and the following. This is the more curious, as the French school is entirely obliged to Linnæus for bringing the organs in question into notice, for the purposes of arrangement, Tournefort and his pupils having never adverted to them.

42. *Borragineæ*, these are the *Asperifoliæ*, ord. 41, of Linnæus, surely better placed by him between his *Perso-*

natae and *Verticillatae*. The order is very natural, and Jussieu's criticism upon it excellent.

- | | | |
|-------------------------|---|---|
| | { | To these Linnæus has no analogous |
| 43. <i>Convolvuli</i> . | | order, most of the genera in the two |
| 44. <i>Polemonia</i> . | | first being referred to his <i>Campana-</i> |
| 45. <i>Bignoniæ</i> . | | <i>ceæ</i> , order 29, and of the last to <i>Per-</i> |
| | | <i>sonatae</i> . |

In this instance we cannot but admit the superiority of Jussieu's arrangement.

46. *Gentianæ*—a very natural and distinct order, confounded by Linnæus with his *Rotaceæ*, ord. 20, to which it has but little relationship.

47. *Apocineæ*—precisely the Linnæan *Contortæ*, ord. 30, a most distinct and curious tribe, though both the great authors, of whom we are treating, have been mistaken in referring hither a genus or two, which do not at all belong to it. See our remarks on this 30th order of Linnæus.

48. *Sapotæ*—an order of which Linnæus had no perception. Some of its genera find a place among his *Dumosaæ*, ord. 43, an assemblage which, he ingenuously confesses, did not satisfy himself.

CLASS 9.

49. *Guaianæ*. Of this also Linnæus had no distinct ideas. Some of the genera he places with his *Bicornes*, ord. 18. Yet some pupils of Jussieu have refined upon this and the last, and he himself has founded an order of *Ebenaceæ*, upon the first section of his *Guaianæ*;—see Brown's *Prodromus*, 524.

50. *Rhododendra*.

51. *Ericæ*.

These two collectively answer to the *Bicornes*, ord. 18, of Linnæus, an error or two, on either part, excepted.

52. *Campanulaceæ* nearly correspond with the genuine *Campanaceæ*, ord. 29, of Linnæus, from whence, as we have before hinted, *Convolvulus* and its allies are well separated in the system of Jussieu.

CLASS 10.

53. *Cichoraceæ*, a most natural order, the *Compositæ semiflosculosæ*, ord. 49. sect. 2. of Linnæus. The essential character of this 10th class is adopted from the artificial system of Linnæus, the united anthers, *antheræ connatæ*; a circumstance never adverted to by any systematic writer before him. Yet it is not absolutely without exception; witness the genera of *Kuhnia*, *Sigesbeckia*, and *Tussilago*.

54. *Cinarocephalæ* answer nearly, at least in principle, to the *Compositæ capitatæ*, ord. 49. sect. 1.

55. *Corymbiferæ* embrace all the remaining *Compositæ*, including the last section of that order, *nucamentaceæ*, some of which Jussieu terms *Corymbiferæ anomalæ*; such as *Iva*, *Parthenium*, *Ambrosia*, *Xanthium*, and even *Nephelium*.

CLASS 11. Distinguished from the last Class, only by having separate anthers.

56. *Dipsaceæ* consist of some of the Linnæan *Aggregatæ*, ord. 48. See our remark under Jussieu's 26th order. There is ample room for speculation on the affinities and distinctions between these *Dipsaceæ*, the *Proteæ*, ord. 26th, and the whole of Jussieu's 10th class last mentioned. Their contemplation involves questions at any time sufficient to excite a botanical war—such as, what belongs to the inflorescence, and what to the flower? what is a calyx, and what the crown of the seed? what is superior and what inferior insertion? what a simple and what a compound flower?

57. *Rubiaceæ*, a vast and important order, composed, not only of the Linnæan *Stellatæ*, ord. 47, but also of numerous tribes of shrubby plants, very few of which had been referred to the *Stellatæ*, and many of them had not fallen under the notice of Linnæus at all. Jussieu shines in the elucidation of this order, and has well indicated certain characters in the habit, especially that of the intrafoliaceous sheathing stipulas.

58. *Caprifolia* are nearly equivalent to the 4th, or last section of Linnæus's *Aggregatæ*, ord. 48, except *Viburnum* and its allies, with *Cornus* and *Hedera*; the former placed, without much reason, in the Linnæan *Dumosæ*; *Cornus* with the *Stellatæ*; and *Hedera* in *Hederaceæ*, ord. 46, nearly agreeing with Jussieu's 59th next mentioned. *Cornus* and *Hedera*, being both allowed to be polypetalous, really belong to the next class, as the author could not but perceive. Indeed Jussieu's 11th and 12th classes, however distinct in theory, naturally slide into each other.

CLASS 12.

59. *Araliæ* answer to the Linnæan *Hederaceæ*, ord. 46, *Hedera*, *Vitis* and *Cissus* excepted, which Linnæus himself appears to have had some idea of removing from *Panax*, *Aralia*, &c.

60. *Umbelliferæ* of course correspond with the *Umbellatæ*, ord. 45, of Linnæus, one of the most natural of the whole.

CLASS 13.

61. *Ranunculaceæ* answer to the Linnæan *Multisiliquæ*, ord. 26. The authors differ in the denomination of the parts of the flower, Jussieu's *calyx* being sometimes the *corolla*, and his *petals* the *nectaries*, of Linnæus.

62. *Papaveraceæ* are, except *Hypercium* and *Fumaria*, Linnæan *Rhoeadeæ*, ord. 27.

63. *Cruciferæ* the Linnæan *Siliquosæ*, ord. 39, so natural an order, that we can scarcely say to which it is next akin.

64. *Capparides* mostly Linnæan *Putamineæ*, ord. 25, with some very anomalous genera subjoined as related thereto, *Reseda*, *Drosera* and *Parnassia*, not without great and well-founded doubts of the author.

65. <i>Sapindi.</i>	{	These are comprehended in two of the sections of the <i>Trihilatæ</i> , ord. 23. of Linnæus.
66. <i>Acera.</i>		
67. <i>Malpighiæ.</i>		
68. <i>Hyperica.</i>		

Ascyrum and *Hypericum*, the only real

genera of this order, are, with *Cistus*, subjoined to the Linnæan *Rotaceæ*, ord. 20 ; certainly with no very evident reason.

69. *Guttiferae* constitute a well-marked order, to which Linnæus has nothing analogous. Most of the genera that compose it, are either left by him unarranged, or considered as of dubious affinity to any others. Indeed they are generally tropical trees, respecting which he had but slight information.

70. *Aurantia*. Of this likewise Linnæus seems to have formed no idea, since he refers *Citrus* to his *Bicornes*, and leaves *Limonia* undetermined. *Camellia* and *Thea*, subjoined by Jussieu, with some other genera, to this order, as connecting it with the next, appear to us of very dubious affinity to the *Aurantia* ; nor are they much better annexed by Linnæus to his *Columniferae*, ord. 37.

71. *Meliæ* constitute a good order, comprehended, not very judiciously, under the Linnæan *Trihilatae*, ord. 23, above mentioned.

72. *Vites*, consisting only of *Cissus* and *Vitis*, we have already mentioned, ord. 59, as included amongst the *Hederaceæ*, ord. 46, of Linnæus.

73. *Gerania* make a part of the Linnæan *Gruinales*, ord. 14, but *Tropæolum*, a puzzling genus, which Jussieu labours to prove in many respects related to them, is referred by Linnæus, as reasonably perhaps, to his *Trihilatae*.

74. *Malvaceæ* are almost exactly analogous to the *Columniferae*, ord. 37.

75. *Magnoliæ* form an order certainly as little connected with the preceding as any two could be in the most artificial system. See the following.

76. *Anonæ*. The leading genera of this and the *Magnoliæ* compose the Linnæan *Coadunatae*, ord. 52.

77. *Menisperma* are referred by Linnæus to his *Sarmentaceæ*, ord. 11, by their habit more than any just character.

78. *Berberides* constitute a curious order, though liable to some exceptions, of which its author was aware. It entirely escaped the penetration of Linnæus.

79. *Tiliaceæ* a good order, likewise overlooked by him, or partly confounded with his *Columniferæ*, to which it betrays some affinity.

80. *Cisti*. *Cistus* which makes this order, is placed by Linnæus, after *Hypericum*, at the end of his *Rotaceæ*, ord. 20. The reader may wonder to find *Viola* considered as related to *Cistus*, or at least to those species which Jussieu separates therefrom, by an incorrect character, and a faulty name, *Helianthemum*. He attributes to these a capsule of one cell; but one of them at least, *Cistus thymifolius*, has three cells. *Viola*, an anomalous genus, 29, with which it seems to have more points of agreement is ranged by Linnæus at the end of his *Campanaceæ*, ord. ment.

81. *Rutaceæ*. This is a very natural, and now become a very extensive order, of which the genuine idea is confined to Jussieu's second section, and likewise to the second section of Linnæus's *Multisiliquæ*, ord. 26. The plants which compose it have alternate leaves, without stipulas; their herbage abounding with aromatic acrid essential oil, lodged in pellucid cells, as in Jussieu's *Aurantia*, ord. 70. Calyx four- or five-cleft. Petals four or five, alternate therewith. Stamens usually twice as many as the petals, distinguished by something elaborate or peculiar in their structure, by which the genera are often well defined. Germen lobed. Capsule mostly of four or five cells, each lined with a bivalve elastic tunic, containing one or two polished seeds. *Diosma* and *Empleurum*, subjoined as akin to *Rutaceæ*, are genuine specimens of the order, though the latter has a capsule deprived of three or four of its lobes or cells, and wants petals. *Melianthus* has no business here. It ranks with the Linnæan *Corydales*, ord. 24, much more properly, though a very puzzling genus. The students at Paris,

in our time, used to amuse themselves with the idea, that the Professor would not allow this fine plant a place in the garden, because he knew not where to class it in his system.

82. *Caryophylleæ* are exactly analogous, except a few rather doubtful genera at the end, to the similarly named 22nd order of Linnæus. But between this very natural tribe and the last, *Rutaceæ*, there is a *hiatus valdè deflendus*, as to any natural affinity; the present order being much more related, as Jussieu candidly indicates, to the *Amaranthi*, ord. 30, and proving that the presence or absence of a corolla, is no more infallible than any other character, for a general principle of arrangement.

CLASS 14.

83. *Sempervivæ* are the second section of Linnæus's *Succulentæ*, ord. 13.

84. *Saxifragæ* are chiefly the fourth section of the same.

85. *Cacti* consist merely of *Ribes* and *Cactus*, as artificial a combination as most in the sexual system itself. The former Linnæus ranks with his *Pomaceæ*, ord. 36; the latter is the first genus of his *Succulentæ*.

86. *Portulacææ* are selected out of the first and third sections of the *Succulentæ*.

87. *Ficoideæ* consist of more of the same.

In this part of their respective systems, we find it more difficult than usual to follow the ideas of the learned authors. Habit seems to have guided Linnæus; but Jussieu tracing, in his last five orders, nearly the same affinities, has somewhat strained his technical characters to confirm them.

88. *Onagrææ* accord, in the main, with the Linnæan *Calycanthemæ*, ord. 17. They well connect the five preceding orders with the following. *Bæckeæ* belongs to the *Myrti*.

89. *Myrti* are the Linnæan *Hesperideæ*, a very natural family, much amplified by Jussieu from recent discoveries.

90. *Melastomæ* are not distinguished by Linnæus from his *Calycanthemæ*.

91. *Salicariæ* are in the same predicament. Jussieu has considerably the advantage here.

92. *Rosaceæ* embrace the *Senticosæ*, ord. 35, and *Pomaceæ*, ord. 36, of Linnæus, nor can there be a more natural assemblage.

93. *Leguminosæ* comprehend, in like manner, two Linnæan orders, *Papilionaceæ*, the 32nd, and *Lomentaceæ*, the 33rd, which we should be disposed to keep distinct, however nearly they must be considered as akin. The Linnæan characters, though often termed artificial, serve Jussieu for the distinctions of his sections.

94. *Terebintaceæ*, on order learnedly sketched out, rather than completed, by Jussieu, which seems entirely to have escaped the perception of Linnæus. It brings together many things which he either did not pretend to arrange, or which clogged some of his orders.

95. *Rhamni* constitute a very natural order, of which the Linnæan *Dumosæ*, ord. 43, are but a sketch, confessedly imperfect.

CLASS 15.

96. *Euphorbiæ* are Linnæan *Tricoccæ*, ord. 38.

97. *Cucurbitaceæ* agree, in name as well as idea, with the 34th of the Linnæan orders.

98. *Urticæ* are nearly analogous to *Scabridæ*, ord. 53, except that *Piper* is mentioned as related to them, instead of being referred to a monocotyledonous order with *Arum*, *Pothos*, *Acorus*, &c. Yet its germination is rather hinted at than determined, nor does any thing positive seem to be known on that subject.

99. *Amentaceæ* are mostly what Linnæus has, under the same appellation, in his 50th order.

100. *Coniferæ* are his 51st, bearing the same name.

As Linnæus enumerates, at the end of his Natural Orders, 116 genera, which he could not then satisfac-

torily refer to any one of them ; so Jussieu, at the conclusion of his System, reckons up 137, which, as we have already observed, he denominates *Plantæ incertæ sedis*. These are disposed synoptically, by their petals, germens and styles. It is remarkable how nearly, allowing for new discoveries, Jussieu accords with Linnæus in the number of such genera. These lists have both been greatly diminished by subsequent consideration, or more complete information.

The attention of botanists, first directed by Gærtner, to the minute and curious diversities of structure in the parts of the seed, has greatly assisted Jussieu and his followers in correcting and improving the details of his system. Hence he has been led to favour the world with several essays on particular families, or orders, in the *Annales du Museum d'Hist. Nat.*, some of which have appeared in the very valuable *Annals of Botany*, published by Dr. Sims and Mr. König. In these, several of the difficulties, which originally embarrassed their author, are lessened or removed, but on these it is not our purpose to enter. A new edition of Jussieu's *Genera Plantarum*, which has long been preparing, cannot fail to prove almost a new work ; more valuable perhaps for the abundant information which it must afford, concerning the characters and affinities of particular genera, than for any thing concerning a general natural system, to perfect which the scientific world has not, as yet, sufficient materials.

As we cannot here undertake to detail Jussieu's own corrections or improvements of his system, neither can we explain what has been attempted, with the same design, by the late ingenious M. Ventenat, or by those excellent living botanists, M. DeCandolle, or Mr. Brown. We shall only observe, that Ventenat, too servile to Jussieu, explicitly contends for the natural method of classification, as superseding the artificial one, and that he aims at proving this to have been the intention of Lin-

næus. Yet nothing can be more positive to the contrary than the remarks of the latter, in the preface to his *Ordines Naturales* at the end of his *Genera Plantarum*. He there declares that his "artificial method is alone of use to ascertain plants, it being scarcely possible to find a key to the natural one." "Natural orders," he continues, "serve to teach the nature of plants, artificial ones to distinguish one plant from another." If it be said that Jussieu, having invented a key, or a set of distinctive characters, to his orders, has removed this objection, we would ask, What becomes of his doubtful genera, as numerous as those of Linnæus? or moreover, How is any student, using his system analytically, to make out a single unknown plant? That the pupils of Jussieu have ever been aware of this, the writer of the present essay very well knows. He has always found them, in conversation, aiming compliments at their illustrious master, by contending for the great difficulty and uncertainty of the Linnæan artificial system; by which palpable absurdity they betrayed their secret opinion of Jussieu's. On the other hand, the intelligent and candid DeCandolle, adopting the just opinion of Linnæus, that plants are allied to each other rather in the form of a table, or map, than in a linear series, actually proposes such a series as *necessarily artificial*, in his *Theorie Elementaire de Botanique*, 213. Concerning the precise disposition of the genera in this series, we believe scarcely two botanists would agree; nor might their contentions be unprofitable; but they would never teach, either a tyro or an adept, to ascertain an unknown plant. We will venture to go further, and to declare our opinion, founded on long observation, that botanists who are thus perpetually intent on the abstract theory of classification, scarcely attain any excellence in the technical discrimination, or definition, of what are really founded in nature, the species or genera of the vegetable kingdom. Those err greatly who seek to improve the system of Jussieu, or any other, by refining

too much on his distinctions, and subdividing his orders ; than which nothing is more easy. Judgement and extensive knowledge are displayed in tracing out the most essential points of agreement in natural objects ; not in exalting into unmerited importance the most minute differences. Hence the very conciseness of Linnæus gives perspicuity to his descriptions and definitions. These afford the most instructive study, whatever mode of classification we may think most convenient.

The French school has been much flattered by our able countryman Mr. Brown, having classed his *Prodrumus* of the New Holland plants after the method of Jussieu ; and many a botanist enjoys this national triumph who is certainly not competent to appreciate the merit of that work. The plants of so novel a country could not, at this time of day, have been presented, with so much advantage, to a philosophical botanist, as in some natural arrangement, however imperfect ; nor will many students travel thither, to make them out by methodical investigation. The touchstone of our learned friend's book however will be the *Plantæ incertæ sedis*, nor can it be judged, as to the merit of the system employed, till it arrives at that conclusion. He himself will surely not reckon it complete without a Linnæan index,

“To give the precious metal sterling weight.”

To the President of the Linnæan Society of London.

Sir,

Surat, January 11, 1810.

ABOUT three years back the exigence of professional duty led me to a sequestered province of Malabar, where the *Cardamomum minus* was indigenous, and engaged a very large proportion of the industry of the natives, and was productive of much revenue. As the period of my visit coincided with the season of fructification, I availed

myself of the occasion to attempt its botanical description; and having a good draughtsman, I caused him to delineate as scientifically as I could its various parts, and in the different stages of fructification. This drawing, with an account of the culture, as performed by the natives, was the subject of a tract,—however inadequate in the execution, interesting from the erroneous and discrepant descriptions which had hitherto been published either by botanists or others.

Of the merit of my labours I shall only predicate, but with a confidence founded on the fact, that the delineation of the parts of fructification is most accurate, and that I witnessed every thing I advanced relative to the crops, their culture, and collection. The result of my essay was intended by my much lamented friend Dr. James Anderson, of Madras, whose approbation it obtained, for presentation to the Asiatic Society of Calcutta; and this hint was conveyed to Lord William Bentinck, to whom the tract and drawing was sent; but the commotions which occupied and agitated the Governor's leisure during the latter months of his administration, prevented all future reference to a matter relatively so unimportant.

With this preamble for your information, I consign the essay and its merits to your better judgement and decision.

I am, with much respect, Sir,

Your obedient and humble servant,

DAVID WHITE, M.D.

*Superintending Surgeon,
Province of Guzerat.*